V. N. KARAZIN KHARKIV NATIONAL UNIVERSITY
Education and Research Institute "Teachers' Academy"
Department of Innovative Pedagogy, Educational Transformations and Leadership

MASTER'S THESIS

Title: «Digital technologies in managing the learning process of students in universities of the people's republic of China»

Completed by 2nd year student,
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specialty 073 «Management»
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Management»
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Supervisor: **Nataliia Tkachova**,
Doctor of Pedagogical Sciences,
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Reviewer: **Anna KOTOVA**, PhD:

Kharkiv – 2025

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

V. N. Karazin Kharkiv National University

Educational and Research Institute "Teachers' Academy"

Department of Innovative Pedagogy, Educational Transformations and Leadership

Graduate degree Master

Specialty 073 "Management"

APPROVED BY
Head of Department

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"26" june 2025 year

TASK

TO MASTER THESIS

Bai Wenzhe
(last name, name of the student)

1. Title «Digital technologies in managing the learning process of students in universities of the people's republic of China»

Supervisor: ***Nataliia Tkachova****, Doctor of Pedagogical Sciences, Professor*
(last name, name, degree, academic rank)

approved by the order of the university from October 11, 2025 year № 4901-5/3774

2. The term of the student's submission of thesis on December 17, 2025

3. List of issues that need to be developed

1. To analyze the theoretical foundations of digital technologies in the management of the learning process

2. To examine the current practice of integrating digital technologies in the management of the learning process in a selected educational institution

3. To develop recommendations for improving the use of digital technologies in managing the learning process

4. Work plan

№	Stages of work
1	Approval of the thesis content
2	Preparation of the thesis' first section
3	Completion of the first section according to the supervisor recommendations. Writing the thesis' second section
4	Completing of the second section according to the supervisor recommendations. Preparation of the thesis' third section
5	Completing of the third section according to the supervisor recommendations. Preparation of a report for a scientific conference with a presentation of the main results of the thesis
6	Writing of the introduction, conclusions of the thesis. Making references list
7	Submission of the thesis to the Department of Innovative Pedagogy, Educational Transformations and Leadership

5. Date of assignment issue " 26" June 2025 year

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CONTENTS

INTRODUCTION

Relevance of the Topic. Digital technologies are becoming a strategic tool for modernizing the higher education system, enabling new approaches to organizing, coordinating, and monitoring the educational process. Digital learning management is not only a technical but also a managerial category aimed at improving the efficiency of educational processes, the quality of specialist training, and the sustainable development of universities. The implementation of artificial intelligence tools, cloud platforms, big data systems, and intelligent learning management systems enables the creation of adaptive digital ecosystems in which educational processes become more flexible, personalized, and transparent. Such technologies not only automate administrative functions but also form the basis for making informed management decisions based on the analysis of student learning data. The experience of Chinese universities is particularly instructive, as China is demonstrating a systemic approach to the digital transformation of education management, actively combining innovative technologies with state development strategies. The study of digital learning management mechanisms in Chinese universities has high scientific and practical significance, as it contributes to the development of effective educational management models focused on the quality, innovation, and competitiveness of higher education.

The aim of the study is to generalize the scientifically valuable theoretical and practical contributions of Chinese specialists regarding the use of digital technologies in managing the student learning process in universities of the PRC.

To achieve this aim, it is necessary to accomplish the following tasks:

1. To examine the theoretical foundations of digital technologies in managing the learning process of university students in China, identifying their essence and significance for modern higher education.

2. To analyse the specific features of applying digital technologies in the management of university education in the People’s Republic of China, considering the characteristics of the national education system.

3. To investigate the theoretical perspectives of Chinese scholars on the integration of digital technologies into student learning management.

4. To assess the current state of digital learning in Chinese universities, including the implementation of learning management systems and digital platforms.

5. To identify barriers, technological limitations, and potential areas for improvement in the integration of digital technologies in learning management.

6. To develop a comprehensive strategy for enhancing the effectiveness of learning management systems, including methods for integrating digital platforms, improving teaching quality, increasing student engagement, and implementing systems for assessing learning outcomes.

Object of the Research. the process of implementing digital technologies in the management of the student learning process in universities of the PRC.

Subject of the Research. the theory and practice of using digital technologies in the management of the student learning process in universities of the PRC.

To solve the defined tasks, the following research methods were applied: analysis of regulatory documents in the field of higher education, scientific pedagogical literature on the outlined problem, generalization of the experience of implementing digital technologies in the management of student learning in universities of the PRC.

Scientific novelty of the research results lies in the systematization and generalization of theory and practice concerning the use of digital technologies in managing the student learning process in universities of the PRC.

Practical significance of the research results lies in the fact that the formulated theoretical provisions and developed methodological recommendations can be successfully used to improve the process of applying digital technologies in the management of student learning in universities of the PRC.

1. THE THEORETICAL BASIS OF DIGITAL TECHNOLOGIES IN MANAGING THE LEARNING PROCESS OF UNIVERSITY STUDENTS IN CHINA

1.1. The Essence and Significance of Digital Technologies in the Management of Modern University Education

In the information age, striving to improve the level of educational management, Chinese universities began to develop their own education management systems that overcome time and space limitations, thereby comprehensively improving the learning management process [20]. According to C. Ma (2025) [29], in recent years, Chinese education has made significant progress by integrating digital technologies into educational processes. This has improved the quality of education and equality of access to education across the country. Significant progress has been observed in the creation of a national intelligent education platform and the popularization of intelligent campuses. Furthermore, the positive results of digital transformation have been reflected in the expansion of internet coverage and the development of digital competence among students and teachers. The deployment of network infrastructure at higher education institutions has laid the foundation for digital education, enabling the exchange of high-quality educational resources between educational institutions and the effective use of online platforms for learning and teaching.

Understanding educational management theory is vital for professionals, as it reveals the interrelationships and interactions between various principles and components of the educational process. According to S. G. Alimova (2025) [5], educational management is a key factor in improving the quality of teaching and learning, ensuring the effective organization and management of educational processes. Educational management is a crucial tool for improving the learning and teaching system, and the implementation of effective management strategies can significantly enhance the quality of the educational process. According to Berkat, Setinawati, and Basrowi (2025) [8], effective management approaches can create an

inspiring educational environment, stimulate the creation of innovative development strategies, and develop problem-solving skills, with a particular focus on a culture of collaboration, innovative curriculum design, and interaction between various sectors.

According to H. A. Al-Ababneh and S. Alrhaimi (2020) [4], education management is an independent institution within the public administration system aimed at ensuring the quality and effectiveness of the educational process. It covers a wide range of tasks, from developing educational guidelines and optimizing the content, forms, and methods of teaching to coordinating all institutional resources. A comprehensive approach to management involves utilizing human, technological, logistical, informational, and financial potential to achieve strategic educational goals and the comprehensive development of students. According to H. Monoarfa, et al. (2023) [38], in the context of Industry 4.0, the education system is faced with the need for profound transformations aimed at improving management efficiency and developing leadership competencies. This requires updating curricula, teaching methods, infrastructure, and training qualified personnel. Furthermore, modern educational management should be based on partnership and interaction with various stakeholders, which ensures flexibility, innovation and sustainable development of the educational system.

According to Y. Yang (2024) [69], educational management and educational administration are interrelated yet independent concepts that form the theoretical foundation of modern educational administration. Educational management encompasses a system of targeted actions such as planning, organization, and control, aimed at implementing educational policy and achieving educational goals. Educational administration, in turn, involves the interaction of government agencies, public organizations, and civil society in jointly addressing educational challenges. Understanding the differences and interrelations between these concepts is key to advancing the theory and practice of educational administration, as well as formulating effective strategies for the development of educational systems.

Thus, educational management is a comprehensive management system aimed at ensuring the effective functioning and development of educational activities at an educational institution. It encompasses strategic and operational planning, organization of the educational process, motivation of participants in educational relationships, monitoring and analysis of results, as well as the continuous improvement of the content, methods, and forms of instruction. At the core of educational management is the coordination of the efforts of all participants (administration, teachers, students, parents, and partner structures) with the goal of achieving high-quality educational services, developing competencies sought after by society, and developing the student's personality. Such management is viewed not only as a managerial function but also as a dynamic system focused on innovation, humanization, and sustainable development of the educational environment. The main functions of educational management are presented in Figure 1.1.

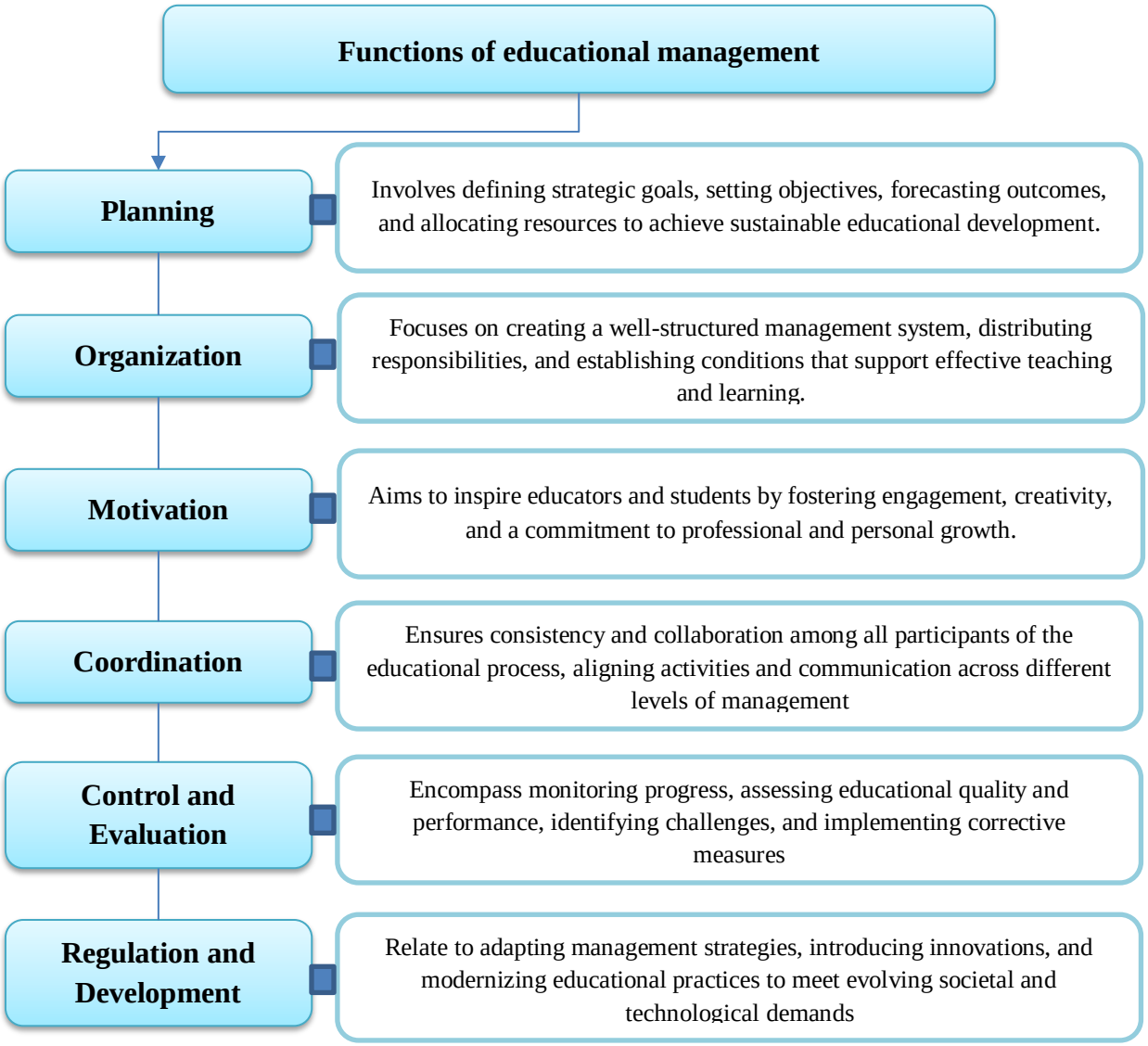

Fig. 1.1. Functions of educational management

Source: self-development based on [38], [69]

Thus, educational management functions form a holistic system that ensures sustainability, flexibility, and the progressive development of education. Their effective implementation contributes to improved quality of education, the introduction of innovation, and the development of the professional potential of teachers and students in a constantly changing educational environment.

The principles of educational management represent a set of fundamental ideas and principles that define the logic, structure, and direction of managing an educational system. They form the methodological basis for management decisions, ensuring the integrity, effectiveness, and innovation of the educational process, as

well as its sustainable development in a context of constant change. The key principles of educational management are presented in Figure 1.2.

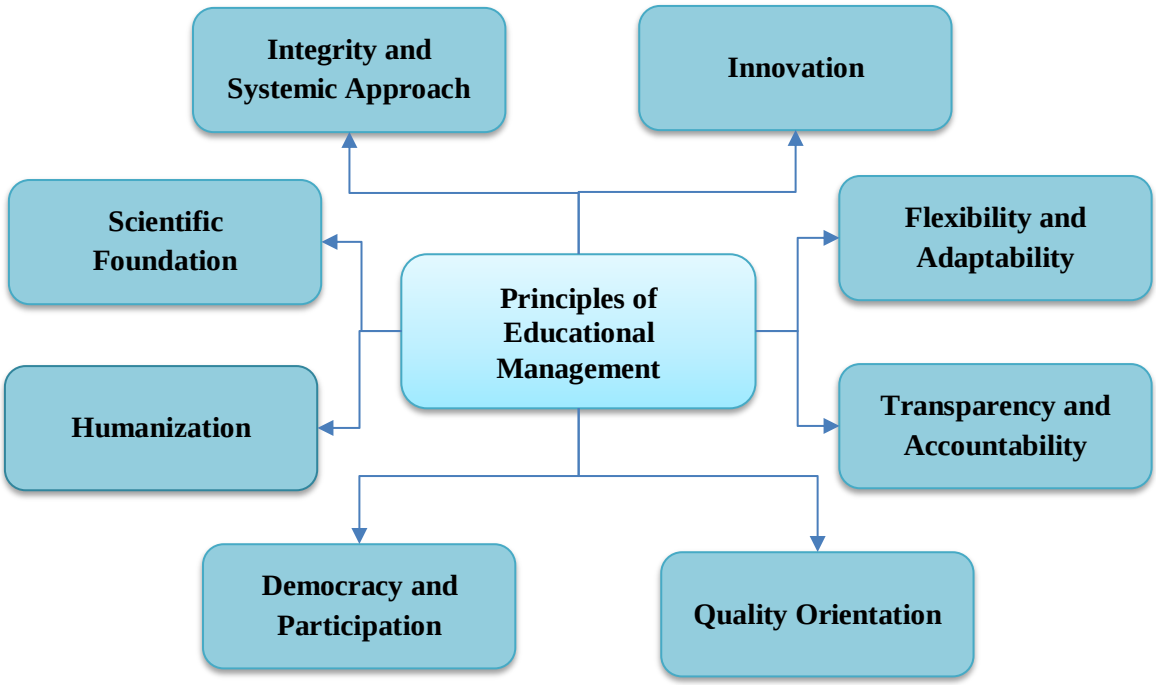

Fig.1.2. Principles of Educational Management (by [8])

Source: self-development based on [8]

Thus, the principles of educational management form the basis for strategically sound and flexible management of the educational process. Their application ensures harmonious interaction among all participants, improves the quality of educational services, stimulates innovation, and promotes the continuous development of an educational environment oriented toward the dynamic needs of students and contemporary societal challenges.

In the era of artificial intelligence, digital transformation of education is an innovative, systemic, and fundamental change in the field of education, opening up new opportunities for its improvement and sustainable development. According to X. Yin and C. Ying (2025) [71], digital transformation in higher education should be regarded as the process of integrating digital technologies into learning and teaching, which leads to changes in the learning environment, teaching paradigms, assessment methods, and resource allocation. The integration of technologies such as artificial intelligence (AI), virtual reality (VR), and the Internet of Things (IoT) plays a key role in the digital transformation process, providing a more flexible and

comprehensive approach to learning. From the perspective of technological development, emerging technologies such as fifth-generation communications, generative artificial intelligence, big data, blockchain, and the metaverse have a significant impact on teaching methods and people's thinking patterns [16]. Table 1.1 presents the definitions of Digital Learning Technologies.

Table 1.1

Definition of Digital Learning Technologies

Author	Definition
Rachana, & Johri, D. (2025) [43]	Digital Learning Technologies are innovative educational tools that transfer the learning process into a digital environment and make learning more interactive, engaging, and adaptable to the individual needs of students.
Yin, X., & Ying, C. (2025) [71]	Digital Learning Technologies are digital tools and systems that facilitate seamless, personalized, and accessible learning experiences in a digital environment that accommodates diverse learning styles and needs.
Ding, L., & Wu, S. (2024) [16]	Digital Learning Technologies are digital solutions that stimulate the intensive transformation of education, improve the digital education infrastructure, and create a digital ecosystem of educational innovations.
Arifudin, O. (2025) [7]	Digital Learning Technologies are the key to the future of education, offering an innovative approach to meeting the needs of 21st-century learners by overcoming geographical, economic and social barriers.
Zou, Y., et al. (2025) [75]	Digital Learning Technologies are digital tools that make the learning process more flexible and accessible, opening up opportunities for the implementation of adaptive personalized learning practices, and supporting innovative teaching methods such as flipped classrooms and blended learning.
Wang, C., et al. (2024) [59]	Digital learning technologies are an integral part of modern education, expanding time and space and enriching pedagogical contexts. Modern digital technologies are a key factor in enabling education to transform and modernize.
Chattopadhyay, T. K. (2025) [12]	Digital Learning Technologies are digital tools that facilitate the creation of dynamic and interactive learning environments, making education more engaging, accessible, and inclusive.

Source: self-development based on [43], [71], [16], [7], [75], [59], [12]

Thus, digital learning technologies are digital tools and methods used to support, enhance, and personalize the learning process. They encompass a variety of pedagogical approaches: personalized and adaptive learning; project-based and problem-based learning; gamification and game-based methods. The classification of digital learning technologies is presented in Figure 1.3.

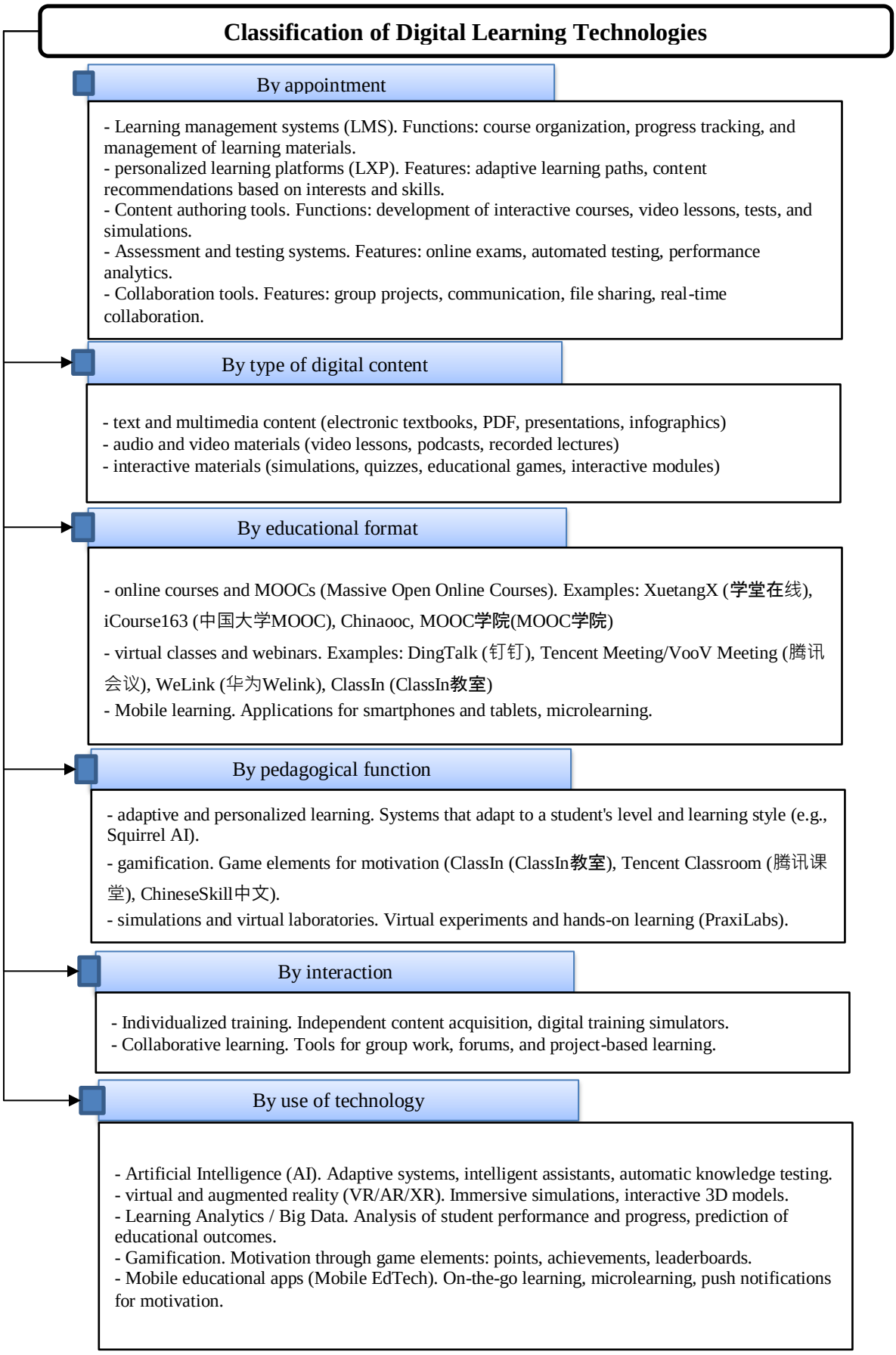

Fig. 1.3. Classification of Digital Learning Technologies

Source: self-development based on [39], [18], [7], [75], [17], [9], [43], [58], [61], [47]

Thus, in the modern educational space, digital technologies are not just an auxiliary tool, but a full-fledged catalyst for the transformation of the educational process. The classification of digital educational technologies demonstrates how a variety of formats, technologies, and methods enables the creation of personalized, interactive, and adaptive educational environments. From virtual labs and simulations to collaborative learning platforms and mobile apps, each category serves to develop key student competencies, combining pedagogical goals with technological innovation. Thus, digital educational technologies not only expand access to knowledge but also shape new approaches to learning focused on engagement, independence, and effective learning.

1.2. Specific Features of the Application of Digital Technologies in the Management of University Education in the People's Republic of China

The development of digital learning in Chinese universities is characterized by global educational trends, but Chinese education nevertheless has its own unique characteristics, related to the centralization of the educational system and the national strategy of digital modernization. Global trends in digital transformation of education are actively integrated into Chinese higher education, such as online courses, learning management systems, educational platforms based on artificial intelligence, virtual, augmented, and mixed reality, and hybrid learning formats. Nevertheless, the Chinese education model is based on national programs closely linked to state socioeconomic development objectives. This combination allows China not only to keep pace with modern innovative processes affecting the higher education system globally but also to shape a unique educational trajectory that reflects its cultural and socioeconomic characteristics [64]. According to Wen-hsin Yeh (2025) [63], China's current development paradigm is characterized by the growing importance of higher education, with universities becoming more Western-oriented, more elitist in ethics, less overtly governed by top-down governance, and more innovative in their teaching methods. According to V. K. Venni, et al. (2025) [56], modern Chinese universities play a vital role not only in national development

but also in addressing socioeconomic challenges. According to M. Jing, et al. (2025) [23], in China, higher education serves as both an innovation engine and a custodian of cultural heritage, while digital transformation extends beyond infrastructure modernization. The 2024–2035 Master Plan for Transforming China into a Leading Country in Education emphasizes the government's commitment to positioning Chinese universities as competitive global knowledge production centres for the digital age.

With the rapid development and evolution of digital educational technologies, higher education institutions face the pressing challenge of strategically integrating digital solutions into curricula and pedagogical approaches. The creation of digital educational platforms opens up opportunities to deliver new-quality educational services and creates an inclusive learning environment. Diversity is a key feature of 21st-century learning, so a higher education institution's educational platform must include a variety of tools to support and develop it. Effective use of digital tools can play a key role in ensuring a comprehensive and dynamic educational experience. Table 1.2 presents the key elements of the 21st-century higher education framework—Education 4.0.

Table 1.2

Key elements of the structure of higher education in the 21st century – Education 4.0.

Content (built-in mechanisms for adaptation skills)			*Experiences (leveraging innovative pedagogies)*		
	**Global citizenship skills**	Foster global awareness, sustainability mindset, and active participation in the digital global community.		**Personalized and self-paced learning**	Shift from standardized instruction to adaptive learning that meets individual needs and allows flexible progress at each learner's own pace.
	**Innovation and creativity skills**	Develop skills in problem-solving, analytical thinking, creativity, and system analysis through digital tools, AI, and modeling technologies.		**Accessible and inclusive learning**	Move from classroom-limited education to inclusive learning where everyone has equal digital access.

	**Technology skills**	Develop digital literacy through programming, responsible tech use, and advanced digital tools.		**Problem-based and collaborative learning**	Evolve from process-focused teaching to project- and problem-based learning that fosters peer collaboration and reflects future work environments.
	**Interpersonal skills**	Enhance emotional intelligence through empathy, collaboration, negotiation, leadership, and social awareness.		**Lifelong and student-driven learning**	Shift to continuous, self-directed learning where individuals build and update skills throughout life.

Source: self-developed based on [61]

The digital transformation of education has created new educational trends, often identified with digital learning. The integration of digital technologies into educational practices has transformed traditional educational environments, increasing the accessibility and effectiveness of learning and influencing the motivational aspects of student engagement [9]. Technology opens up numerous opportunities for modern education, radically changing approaches to learning and teaching [6]. The integration of new technologies is fundamentally changing traditional educational paradigms, enriching the learning process and generating innovative pedagogical methods and approaches [52].

In modern scientific research, the concept of digital transformation of education is closely intertwined with innovative pedagogical models such as digital learning, e-learning, online learning, distance learning, blended learning, and mobile learning. Each of these models shares a common thread: learning using digital technologies.

Digital learning is a broad term encompassing various forms of education implemented through digital technologies [32]. Digital learning defined as a modern format of the educational process based on the use of digital tools and technologies for the development of key professional competencies. The use of intelligent systems, personalized approaches, and flexible formats can significantly improve

the effectiveness of learning, ensuring accessibility and engagement of students at all levels of education. According to O. Arifudin O. (2025) [7], digital learning is an integral part of the global educational landscape, ensuring accessibility, personalization, and continuity in the implementation of educational activities. By providing students with access to educational content regardless of their location or socioeconomic status, digital learning contributes to the democratization of education and increases its inclusiveness. Researchers Y. Zou, et al. (2025) [75] emphasize that digital learning is characterized by the integration of digital technologies into educational practice, offering flexible and accessible learning opportunities for students of different levels. Digital learning enhances learning through accessibility, flexibility, engagement, and personalization. According to E. Dritsas and M. Trigka (2025) [17], digital learning is learning that utilizes a wide range of digital tools and pedagogical strategies to enhance teaching and learning through accessibility, flexibility, and interactivity. According to N. Yadav (2024) [67], digital learning offers exciting opportunities to leverage new technologies and pedagogical innovation, promote lifelong learning, and ensure equity and inclusion.

Technological advances and the development of digital educational technologies have fueled the rise of e-learning. This pedagogical model utilizes digital technologies, innovative pedagogical approaches, and personalized content to enhance students' learning experiences. Key features of e-learning educational services include speed, intelligence, multisensory access, continuity, and sociality [1]. Online learning is an educational format in which the entire learning process is conducted online, including access to digital resources, platforms, and interactive tools, allowing students and teachers to interact both in real time and asynchronously. Distance learning is a method of education in which teachers and students are located in different locations, and instruction is delivered through a variety of communication channels - from online platforms and video lectures to email - enabling learning outside the traditional classroom. Mobile Learning (M-Learning) is learning through mobile devices that allows you to gain knowledge and

complete tasks anytime and anywhere, providing flexibility and a personalized approach.

The demand for more flexible, student-centred educational approaches has created the conditions for the development of hybrid, blended learning models, which aim to combine the benefits of two educational environments−face-to-face interaction and technological innovation. According to S. Thomas, et al. (2025) [54], blended learning is not only a response to technological progress but also a conscious shift toward more adaptive and inclusive educational practices. This method, which combines face-to-face instruction with elements of online learning, is a promising pedagogical model in the context of the development of digital educational technologies. Blended learning demonstrates the sustainable evolution of modern education, combining the benefits of face-to-face interaction with digital flexibility.

Driven by the rapid development and evolution of digital educational technologies, the digital education landscape is in a state of constant flux. Current trends influencing changes in the educational paradigm include the development of generative artificial intelligence, virtual, augmented, and mixed reality, the growing popularity of mobile and online learning platforms, massive open online courses, gamified virtual environments, and the development of adaptive learning management systems and predictive analytics. Modern trends in digital learning presented in Figure 1.4.

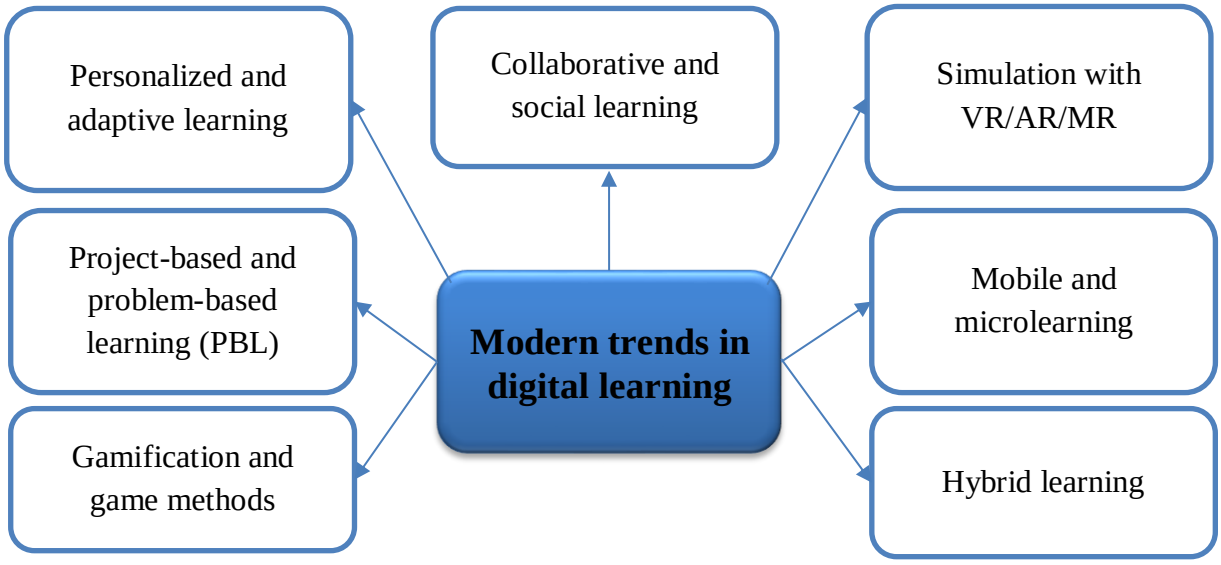

Fig. 1.4. Modern trends in digital learning

Source: compiled based on [54], [1], [67], [17])

Thus, modern digital learning trends are stimulating the active and diverse use of digital technologies in the educational process. AI-powered digital educational platforms enable instructors to develop flexible courses, providing students with access to materials anytime and from anywhere, making the educational experience more personalized. Adaptive systems help tailor assignments and resources to each student's needs, enhancing learning efficiency. Gamification and interactive tools foster creativity and engagement, supporting pedagogical methods aimed at developing critical thinking and practical skills. Learning analytics facilitates performance monitoring and automated assessment, providing instructors with data for more informed pedagogical decisions. Thus, modern digital technologies are becoming more than just a tool, but a strategic support for pedagogical initiatives, enabling the creation of an innovative, flexible, and student-centered educational environment.

1.3. Theoretical Views of Chinese Scholars on the Application of Digital Technologies in Managing the Learning Process of University Students

Digital technologies are becoming an integral part of modern education, opening up vast opportunities to improve the effectiveness of the learning process. They ensure access to knowledge anytime and anywhere, allow for personalized learning tailored to each student's needs, increase engagement through interactive tools, and foster the development of critical thinking, creativity, and digital literacy. However, the use of digital technologies also has its limitations: dependence on technology and the internet, reduced face-to-face interaction, the risk of information overload, the need for high digital competence, and concerns about the security and privacy of student data. Fig. 1.5 presents the advantages and disadvantages of using digital technologies in student learning management.

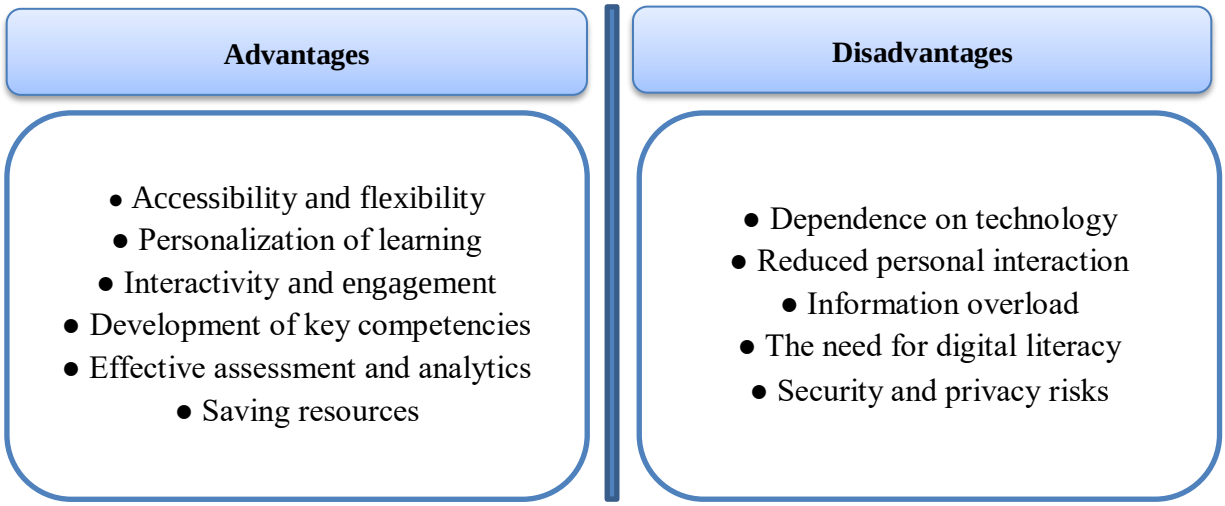

Fig. 1.5. Advantages and Disadvantages of Using Digital Technologies in Student Learning Management

Source: compiled based on [50], [71], [25], [65]

According to the WEF (2024) [61], the integration of innovative digital technologies into educational processes is transforming teaching methods and approaches. This opens up opportunities for individualizing educational strategies and streamlining administrative processes. Furthermore, it enhances students' educational experiences, leading to improved learning outcomes and the acquisition of skills necessary for successful future careers. Table 1.3 presents the specific features of the use of modern digital technologies in educational processes.

Table 1.3

Features of the use of modern digital technologies in educational processes

Digital educational technologies	Features of use in educational processes
Learning Management Systems (LMS)	1. Centralized materials. All educational resources, assignments, and tests are collected in one place. 2. Ease of access. Students and teachers can use the platform anytime and from any device. 3. Personalized learning. The LMS allows to tailor courses to the level and needs of each student. 4. Progress tracking. Built-in analytics tools help monitor progress and engagement. 5. Automation of processes. Automatic assignment checking, notification sending, and schedule management reduce teachers' workload. 6. Interactivity and communication. Forums, chats, and collaborative assignments encourage student interaction and collaboration.
Personalized Learning Platforms (LXPs)	1. Individualized learning paths. The platform tailors content and assignments to each student's level and interests. 2. Adaptability. Content and recommendations are updated based on the user's progress and preferences.

	3. Active engagement. Interactive modules, videos, and case studies encourage independent learning. 4. Skills development. LXP supports the development of both hard and soft skills. 5. Integration with other resources. The platform combines internal and external educational materials. 6. Feedback and analytics. The system provides progress data and recommendations for improving results.
Content authoring tools	1. Development of interactive materials. Allows the creation of multimedia lessons, tests, videos, and simulations. 2. Content personalization. Materials can be adapted to students' levels and needs. 3. Accelerate course preparation. Simplify the process of developing training modules and programs. 4. Integration with LMS/LXP. Created content easily connects to educational platforms. 5. Student engagement. Interactive elements increase interest and engagement in learning. 6. Content can be quickly edited and updated to reflect current information.
Assessment and Testing Systems	1. Objective knowledge assessment. Standardized tests allow for an accurate assessment of student learning. 2. Personalized feedback. Students receive recommendations for improving their performance and addressing knowledge gaps. 3. Automated grading. The system quickly grades assignments, reducing teachers' workload. 4. Progress monitoring. Tracking progress helps adjust the learning process. 5. Diagnostics and forecasting. Identifying weaknesses and predicting the student's future success. 6. Integration with educational platforms. Performance data is easily used by LMSs and LXPs for course adaptation.
Learning Analytics / Big Data	1. Progress monitoring. Collecting and analysing data on student activities allows for real-time tracking of academic performance. 2. Personalized learning. Algorithms identify each student's strengths and weaknesses and adapt materials to their needs. 3. Outcome prediction. Big data can be used to predict student success and the risk of failure. 4. Optimization of the educational process. Analysing the effectiveness of methods and resources helps improve educational programs. 5. Decision support. Data helps teachers and administrators make informed decisions about how to organize instruction. 6. Identifying behavioural patterns. Allows to understand which teaching approaches are most effective for different groups of students.
Collaboration tools	1. Collaboration. Students can work on projects and assignments as a team in real time. 2. Knowledge sharing. Forums, chats, and discussion boards facilitate the exchange of ideas and experiences. 3. Developing communication skills. Improves interaction, argumentation, and presentation skills. 4. Interactive learning. Participation in collaborative tasks increases engagement and motivation.

	5. Accessibility and flexibility. The tools work across devices and anywhere. 6. Support for project-based learning. Enables the implementation of case studies, simulations, and team tasks.
Artificial intelligence technologies	1. Personalized learning. AI selects materials and assignments based on the student's level and needs, making the process flexible and targeted. 2. Smart feedback. Technology provides precise advice and feedback, stimulating activity and development. 3. Developing critical thinking. AI encourages analysis and understanding of information, strengthening intellectual independence. 4. Academic integrity. AI systems help detect plagiarism and verify data reliability, fostering an ethical research culture. 5. Student engagement. The use of AI makes learning interactive, motivating, and dynamic.
Virtual reality (VR) technologies	1. Immersion. Immersion in a virtual environment enhances the sense of presence and makes learning visual. 2. Practical focus. Students can safely practice skills and simulate real-life situations. 3. Personalization. VR scenarios are adapted to the level and needs of learners. 4. Increased motivation. Interactive learning generates interest and encourages active participation. 5. Developing critical thinking. Analysing virtual situations helps make informed decisions. 6. Experimental safety. Allows for experiments and training to be conducted without risk to health or equipment.
Augmented reality (AR) technologies	1. Visual and Interactive. Combines real-world objects with digital elements, making learning visual and interactive. 2. Increased engagement. Visuals and interaction with objects stimulate student interest. 3. Practical application. Allows to practice skills and observe processes in a real-world context. 4. Develops spatial thinking. Helps better understand complex structures and relationships. 5. Safe learning. Allows students to explore dangerous or inaccessible phenomena in a safe manner.
Mixed reality (MR) technologies	1. Integration of the real and the virtual. Mixed reality merges physical and digital environments, creating an interactive learning space. 2. High level of interaction. Students can control virtual objects in a real-world environment, actively participating in the process. 3. Practical training. MR allows to simulate real-life situations and practice professional skills. 4. Personalized experience. The system adapts to the individual goals and level of the student. 5. Developing analytical thinking. A blended environment helps students see the connections between theory and practice. 6. Increased motivation. The effect of presence and interaction makes learning more interesting and engaging.
Mobile Educational Applications (Mobile EdTech)	1. Accessibility of learning. The ability to study anytime and anywhere using a smartphone or tablet. 2. Flexibility and personalization. Apps adapt to individual goals, pace, and learning style.

	3. Interactivity. The use of tests, games, and multimedia materials increases interest and engagement. 4. Continuous learning. Supports the principle of "lifelong learning," allowing for learning outside the classroom. 5. Real-time feedback. Students receive immediate results and recommendations for improvement. 6. Social interaction. Built-in chats and forums facilitate knowledge sharing and collaboration.
Digital Gamification (GamEd)	1. Student motivation. Gamification encourages active participation and interest in learning. 2. Progress and achievements. A system of points, levels, and rewards shows progress and motivates further development. 3. Personalized learning. Assignments and goals can be tailored to the level and needs of each student. 4. Interactivity. Engages through quests, quizzes, and simulations, making the process more engaging. 5. Social interaction. Elements of competition and team games promote collaboration and knowledge sharing. 6. Feedback. Instant results and recommendations help adjust training and improve effectiveness.

Source: compiled based on [39], [18], [7], [75], [17], [9], [43], [58], [61], [47]

In the context of digital evolution, the educational technology landscape is constantly evolving, with innovative platforms and tools emerging to support student learning. The results of a study by M. F. Shahzad, et al. (2025) [50], which examined the mechanisms of using digital technologies in education, showed that the integration of information and communication technologies into the educational process contributes to improved teaching and learning, expanded access to education, and the development of educational collaboration between students, faculty, and educational institutions. A study of 601 Chinese university students confirmed that technology self-efficacy, hedonic motivation, the congruence between learning tasks and technology capabilities, and performance expectations positively influence students' intentions to use digital technologies in education.

The rapid development of digital educational technologies is fundamentally transforming the educational environment, moving it from a traditional, static, text-based model to an interactive and dynamic educational ecosystem. The creation of intelligent learning management platforms enhances management efficiency and helps optimize service quality. According to Y. Zhang (2025) [72], the integration of digital solutions into university management systems and the development of

coordinated and effective intelligent learning management systems improves data efficiency, resource allocation, and learning interaction at all levels, thereby significantly enhancing management transparency and reducing feedback time. According to X. Yin and C. Ying (2025) [71], the integration of digital technologies into learning management systems facilitates the creation of a personalized and accessible learning process that accommodates students' different learning styles and needs. According to A. T. Rosário and J. C. Dias (2022) [46], the widespread adoption of LMS technologies in higher education institutions has revolutionized the educational system by providing the ability to comprehensively evaluate and analyse the learning process and performance of teachers, students, administration, and the academic system as a whole.

Realizing the innovative potential of digital technologies in education promotes flexibility and interactivity. According to X. Ma, et al. (2025) [30] digital resource libraries and virtual learning environments can optimize the learning process, increasing its flexibility and personalization. At the same time, the innovative capabilities of smart campus systems provide convenient learning opportunities, overcoming time and space barriers. According to Y. Lyu, et al. (2023) [28], key factors in the success of digital transformation in education include creating an inclusive learning environment, bridging the digital divide, and improving digital literacy.

Digital technologies in the educational process can improve its quality through personalization and differentiation. According to M. Liu and R. Su (2023) [25], intelligent analysis of educational data and intelligent assessment systems can improve the efficiency and effectiveness of education. Furthermore, through an open and free educational environment, interactive learning, virtual laboratory experiments, and other digital learning methods, digital education can effectively develop professional competencies and skills, stimulate students' interest in learning, promote innovative thinking, and foster independent lifelong learning.

Modern digital educational technologies, such as artificial intelligence and learning analytics, facilitate the implementation of effective peer-to-peer learning

strategies. According to O. Noroozi, et al. (2025) [40], AI-based intelligent assessment systems, learning data analytics, multimodal learning, and group awareness tools contribute to improving the efficiency and effectiveness of peer learning. Digital tools integrated into learning scenarios promote deeper cognitive engagement of students in learning interactions, addressing the diverse needs of students in peer learning settings. According to D. Vergara, et al. (2024) [57], the integration of AI into learning management systems enables an adaptive and personalized learning process, promotes active learning, and supports self-regulated learning in face-to-face, blended, and online environments. According to Y. Walter, (2024) [58], adaptive learning with AI tools can assist students with special needs. The potential of AI in learning is also related to students' ability to overcome cultural barriers. According to J.-C. Ruano-Borbalan (2025) [47], AI contributes to the blurring of boundaries between formal and informal education. A meta-analysis by L. Wang and W. Fan (2025) [60] found that the use of intelligent Chabot tutors in educational settings can have a positive impact on student performance, learning comprehension, and the development of higher-order thinking. However, some differences in effectiveness were found depending on the learning context.

In today's digital era, with the increasing prevalence of remote work, virtual teamwork skills are becoming increasingly important. According to W. Hu and C. Chan (2025) [21], the capabilities of generative AI for personalized interactions, scenario modelling, and personalized feedback can be effectively used to develop and improve virtual teamwork competencies in educational and professional environments. The system's scenario-based design with integrated personalized feedback encourages students to critically reflect on and adapt their teamwork strategies. Virtual collaboration simulations promote self-regulated learning while developing students' metacognitive awareness.

The implementation of gamified approaches to learning can increase student engagement and interest in learning and collaborative learning interactions. According to H. Ahmed, et al. (2025) [2], the integration of cloud-based and gamified systems into educational structures can positively affect engagement,

motivation, and stimulate better learning outcomes. The use of dynamic, system-specific game components based on individual student progress can not only positively influence student concentration but also their desire for collaboration and competitive participation in collaborative learning environments. According to E. Dritsas and M. Trigka (2025) [17], a key advantage of digital learning is its ability to adapt to the individual needs of students. Adaptive learning management systems based on artificial intelligence algorithms can analyse and evaluate student behaviour and performance, offering personalized content and feedback. Adaptive learning approaches enabled by digital technologies demonstrate significant potential for enhancing student engagement, knowledge retention, and overall learning outcomes.

High-quality feedback is crucial for supporting student learning at universities. According to J. Weidlich, et al. (2025) [62], in digital learning settings, providing personalized feedback using learning data analytics promotes student self-reflection and self-regulation. Modern advances in artificial intelligence and the development of learning analytics systems make it possible to automate and scale the delivery of personalized, meaningful, actionable, and pedagogically sound feedback. According to L. Xiaopan (2025) [66], learning management systems, through feedback, increase student engagement and enhance educational interaction, demonstrating organizational flexibility, especially in the context of online education.

Artificial intelligence-based digital educational tools hold enormous potential for implementation in higher education. According to J. Luo, et al. (2025) [27], learning interactions in AI-enabled online systems contribute to significant improvements in students' cognitive knowledge and affective learning outcomes. According to H. Moradi (2025) [39], advanced AI-based language models, such as ChatGPT, demonstrate impressive potential for enhancing pedagogical methods and increasing learning effectiveness. Generative AI tools offer enormous potential for improving the quality and effectiveness of educational practices, including providing personalized content and constructive feedback, online support during

assignments, and recommendations and instructions for completing them. According to R. Ellis, et al. (2025) [18], the application of GenAI in teaching creates evaluative and reflective learning experiences that help students contextualize analytical thinking and develop competencies necessary for future work. However, to fully realize the potential of AI in education, it is necessary to develop digital AI literacy among both students and teachers.

Although the integration of digital technologies into learning opens up new opportunities for improvement, this process is associated with a number of problems and challenges. The results of the research by H. Aldabbas, et al. (2025) [3], which involved 118 students from two universities in the United Arab Emirates (UAE), showed that indicators of learning quality using digital platforms significantly affect the perceived usefulness, student satisfaction, and actual use of e-learning systems. The researchers concluded that educational institutions seeking to maximize the benefits of integrating digital educational systems should pay special attention to quality indicators that directly affect student usefulness, satisfaction, and actual use, which ultimately leads to improved academic performance. The results of a study by Y. Yan, et al. (2025) [68], which involved 253 students from leading universities in China, showed that although students considered AI useful for enhancing learning efficiency and ease of use, concerns remained regarding content accuracy, overreliance, and ethical issues. According to Kato Nabirye (2025) [24], modern e-learning management systems play a key role in changing educational paradigms by introducing innovative digital tools and promoting student-centred approaches. However, successful implementation depends on strategic planning, effective stakeholder engagement, and comprehensive training for faculty, administrators, and students.

There are technical limitations in the implementation of digital learning, such as: weak IT infrastructure at some educational institutions, difficulties in ensuring equal opportunities for students from remote regions and low-income families, insufficient digital competence of teachers, and low technical adaptation of students. Disadvantages of learning in a digital environment also include low student

integrity, limited opportunities for practical learning, decreased motivation and self-discipline, and a lack of live communication with teachers and classmates. According to X. Zhong, et al. (2025) [74], the rapid integration of digital technologies into educational processes increases the demands on digital literacy among teachers. In the current context of the digital transformation of higher education, many teachers face a number of problems and challenges. The lack of systemic guidelines for adaptation to new technologies and the effective use of digital tools prevents the full realization of the benefits of digital learning. Optimizing the higher education system in the context of the influence of digital technologies on all spheres of socio-economic life requires a multifaceted approach. According to S. Xiao, et al. (2025) [65], higher education institutions need to adapt their curricula to new technological trends and industry needs. An emphasis on collaboration between universities and businesses helps align educational programs with industry needs, improves graduate employability, and creates a skilled workforce capable of supporting innovation and promoting sustainable economic growth in a globally competitive environment. Policy reforms needed to optimize technical efficiency and integrate technological advances into the curriculum, develop professional and lifelong learning programs, address skills shortages, and foster a culture of continuous self-improvement. According to Rachana and D. Johri, (2025) [43], addressing information security and data privacy issues for both students and faculty in digital learning is becoming critical. Insufficiently protected management, storage, and use of personal data in the digital environment can pose a serious security threat, especially in education systems. According to M. R. Ranganatha and S. P. Shwetha (2025) [44], a major challenge for innovative development and digital transformation of education systems is their incompatibility with existing technological learning management systems, which entails time and resource costs. Furthermore, the integration of digital technologies into learning and teaching, as well as the creation and maintenance of digital platforms, requires significant capital investments. To ensure the long-term success of digital learning,

higher education institutions must consider the costs, sustainability and return on investment.

Conclusions to Section 1

Thus, educational management is a comprehensive management system aimed at ensuring the effective functioning and development of educational activities at an educational institution. Educational management functions form a holistic system that ensures sustainability, flexibility, and the progressive development of education. Their effective implementation contributes to improved quality of education, the introduction of innovation, and the development of the professional potential of teachers and students in a constantly changing educational environment. The principles of educational management represent a set of fundamental ideas and principles that define the logic, structure, and direction of managing an educational system. They form the methodological basis for management decisions, ensuring the integrity, effectiveness, and innovation of the educational process, as well as its sustainable development in a context of constant change.

In recent years, Chinese higher education has made significant progress in integrating digital technologies into educational processes. Digital learning technologies are digital tools and methods used to support, enhance, and personalize the learning process. Educational practices widely utilize digital educational technologies such as learning management systems (LMS), personalized learning platforms (LXP), content authoring tools, assessment and testing systems, learning analytics/big data, collaboration tools, artificial intelligence technologies, virtual, augmented, and mixed reality (VR/AR/MR), mobile educational applications (Mobile EdTech), and digital gamification (GamEd). The integration of new technologies is fundamentally changing traditional educational paradigms, enriching the learning process and generating innovative pedagogical methods and approaches. Digital learning defined as a modern educational process format based on the use of digital tools and technologies for the development of key professional

competencies. Current trends in digital learning include personalized and adaptive learning, project-based and problem-based learning (PBL), gamification and game-based methods, collaborative and social learning, VR/AR/MR simulations, mobile and microlearning, and hybrid learning. The use of intelligent systems, personalized approaches, and flexible formats significantly improves learning effectiveness, ensuring accessibility and student engagement at all levels of education. Key advantages of using digital technologies in student learning management are: accessibility and flexibility, personalization of learning, interactivity and engagement, development of key competencies, effective assessment and analytics, saving resources. Although the integration of digital technologies into learning opens up new opportunities for improvement, this process is associated with a number of problems and challenges. Key disadvantages of using digital technologies in student learning management are: dependence on technology reduced personal interaction, information overload, the need for digital literacy, security and privacy risks.

2. ANALYSIS OF IMPLEMENTATION OF DIGITAL TECHNOLOGIES IN MANAGING STUDENT LEARNING IN UNIVERSITIES OF THE PEOPLE'S REPUBLIC OF CHINA

2.1. Current State of Digital Learning in Chinese Universities

China's higher education system is undergoing a period of active transformation, at the intersection of demographic shifts, evolving labor market demands, large-scale digital modernization, and the strengthening role of political leadership. These factors are collectively shaping a new direction for university development, stimulating the adoption of innovative educational practices, the adaptation of programs to modern professional standards, and increased engagement between the government and the academic community.

China can be seen as a prime example of a country with a highly centralized higher education model, with public universities accounting for the overwhelming majority (approximately 75%) of all higher education institutions. In 2024, China had 3,119 higher education institutions, including 1,257 undergraduate colleges (including 154 independent colleges), 51 undergraduate vocational schools, 1,562 higher vocational (technical) colleges, and 249 institutions for adult learners. An additional 233 research institutes offer postgraduate programs. The total number of students enrolled in all forms of higher education nationwide is 48.46 million. The average enrollment in regular undergraduate colleges is 17,428, in undergraduate vocational colleges 18,362, and in higher vocational (technical) colleges 10,275. There are 2.1635 million full-time faculty members in the country's higher education system, including 1.3876 million in regular undergraduate colleges, 45.3 thousand in undergraduate vocational colleges, 717 thousand in higher vocational colleges, and 13.5 thousand in adult education institutions. The student-to-faculty ratio is 17.14:1 in regular undergraduate colleges, 16.94:1 in undergraduate vocational colleges, and 18.49:1 in higher vocational colleges. Key indicators of higher education in China are presented in Table 2.1.

Table 2.1

Key Indicators of Higher Education in China for 2022-2024

	Years			Deviation (+/-)	
Indicators	**2022**	**2023**	**2024**	**2024/2022**	**2024/2023**
Number of higher education institutions	3013	3074	3119	106	45
including:					
general baccalaureate colleges	*1239*	*1242*	*1257*	*18*	*15*
vocational bachelor's degree schools	*32*	*33*	*51*	*19*	*18*
higher vocational (technical) schools	*1489*	*1547*	*1562*	*73*	*15*
higher education institutions for adults	*253*	*252*	*249*	*-4*	*-3*
Number of private colleges and universities	764 (25.36% of the total number of colleges and universities)	789 (25.67% of the total number of colleges and universities)	803 (25.75% of the total number of colleges and universities)	39 (0.39%)	14 (0.08%)
including:					
general baccalaureate colleges	*390*	*391*	*388*	*-2*	*-3*
vocational bachelor's degree schools	*22*	*22*	*23*	*1*	*1*
higher vocational (technical) schools	*350*	*374*	*390*	*40*	*16*
higher education institutions for adults	*2*	*2*	*2*	-	-
Research institutions offering postgraduate education programs	234	233	233	-1	-
Total number**s of students studying in all forms of higher education (people)**	46.55 million	47.63 million	48.46 million	1.91 million	0.84 million
Average number of students enrolled in regular undergraduate colleges (people)	16,793	17 194	17,428	635	234

Average number of students studying in vocational schools for bachelor's degrees (people)	19,487	20 127	18,362	-1 125	-1,765
Average number of students studying in higher vocational (technical) colleges (people)	10 168	10 152	10 275	107	123
Number of students in private general education and vocational bachelor's degree programs and colleges (people)	9.2489 million (25.27% of the total number of students in the country)	9.9438 million (26.34% of the total number of students in the country)	10.5224 million (27.04% of the total number of students in the country)	1.2735 million (1.77%)	0.5786 million (0.7%)
Total number of students enrolled in postgraduate studies	1.2425 million	1.3017 million	1.3568 million	1.1143 million	0.0551 million
including:					
doctoral students	*139,000*	*153,300*	*171,100*	*32,100*	*17,800*
master's students	*1.1035 million*	*1.1484 million*	*1.1857 million*	*0.0822 million*	*0.0373 million*
Number of adult undergraduate and college students (people)	4,4002 million	4.4549 million	3.6191 million	-0.7811 million	-0.8358 million
Number of full-time teachers (people)	1.9778 million	2,0749 million	2.1635 million	0.1857 million	0.0886 million
among which:					
work in regular undergraduate schools	*1.3158 million*	*1.3455 million*	*1.3876 million*	*0.0718 million*	*0.0421 million*
in vocational schools at the bachelor's level	*27,800*	*30,800*	*45,300*	*17,500*	*14,500*
in higher vocational (technical) schools	*619,500*	*684,600*	*717,000*	*97,500*	*32,400*
in higher education institutions for adults	*14,700*	*14,100*	*13,500*	*-1 200*	*-600*
Student-to-faculty ratio in regular undergraduate schools	17.65:1	17.51:1	17.14:1	-0.51:1	-0.37:1
Student-to-faculty ratio in vocational schools at the undergraduate level	18.31:1	17.57:1	16.94:1	-1.37:1	-0.63:1

Student-to-faculty ratio in higher vocational schools (colleges)	19.69:1	18.92:1	18.49:1	-1.2:1	-0.43:1
Average cost of educational, research and practical equipment per student	17,527.82 yuan	18,607.85 yuan	19,872.14 yuan	2,344.32 yuan	1,264.29 yuan

Source: compiled based on data of Ministry of Education of the People Republic of China (2025, 2024, 2023) [35-37]

China's education digitalization strategy was shaped by the National Education Reform and Development Plan (2010–2020), the Ten-Year Education Digitalization Plan (2011–2020), and the 13th Five-Year Education Digitalization Plan. A key milestone was the New Generation Artificial Intelligence Development Plan (2017), which identified intelligent education as a key focus. In 2018, the Education Digitalization Action Plan 2.0 was adopted, and the initiatives "Modernization of China's Education 2035" and its five-year plan (2018–2022), the Guidelines for the Construction of a National Digital Educational Resource System, and the Recommendations for the Development of Online Education were implemented. All of these programs reflect the transition from isolated infrastructure solutions to a holistic and integrated digital education system [64].

The National Intelligent Education Platform demonstrates China's significant achievements in creating digital educational resources. Currently, the platform is recognized as the world's largest repository of educational resources. This platform connects 519,000 schools, serving 18.8 million teachers and 293 million students. The platform covers 200 countries and regions. More than 100 million registered users, over 36.7 billion page views, and 2.5 billion visits confirm the platform's significance in supporting national educational goals and education digitalization strategies. The platform offers a wide range of educational resources: 88,000 materials developed for primary and secondary education, more than 10,000 high-quality online courses for vocational education, and 27,000 high-quality massive open online courses (MOOCs) for higher education [30].

China's industrial and technological ambitions, particularly in key areas such as artificial intelligence, renewable energy, biotechnology, and semiconductor manufacturing, are creating a persistent and strong demand for STEM graduates. According to the World Bank's Education in East Asia 2025 report, Chinese universities have significantly expanded their enrolment in computer science, electronics, and engineering programs, with enrolments in these disciplines increasing by 15% between 2022 and 2024, reflecting the country's strategic focus on training talent for high-tech industries and strengthening global competitiveness.

The Chinese Edtech market is poised for sustainable, long-term growth, fueled by a combination of AI innovation, active government support, and the adaptability of leading industry players. Backed by a large user base and a focus on personalized, accessible, and equitable education, this sector is emerging as one of the most promising investment opportunities. As companies continue to develop innovative solutions and align with government strategic goals, the edtech market is shaping a new vision for the future of education in China. In 2023, the edtech market in China was estimated to be worth approximately USD 57.3 billion, demonstrating a robust annual growth rate of 14.17%. Over the past five years, China's edtech sector has experienced significant fluctuations, with a rapid rise during the COVID-19 pandemic followed by a slowdown in 2021 due to regulatory measures related to the "double-cut" policy. However, starting in 2022, the industry began to steadily recover, and by 2023, the number of users of online education platforms reached 349 million, an 11.14% increase compared to the previous year. The industry's revival was driven by a transformation in the educational services offered: an emphasis shifted toward personal development, fostering critical thinking, expanding humanities, and promoting outdoor activities. Technological innovations, particularly the implementation of artificial intelligence-based solutions, also played a significant role, improving the quality and personalization of learning [13].

Online education in China continues to expand, driven by technological innovation, growing demand for digital skills, and proactive government policy. The market is expected to maintain high growth rates in the coming years, playing a key

role in shaping a new education model based on accessibility, flexibility, and innovation. China's educational technology industry is demonstrating a confident path to sustainable growth, supported by policy support, the active adoption of digital solutions, and large-scale investment. According to Statista, the online education market will exceed $100 billion by 2025. One of the key drivers of this growth is the government's "Smart Education China" initiative, launched in April 2024, which aims to modernize the national digital infrastructure and create a unified, intelligent educational space.

Demand for educational technologies in China is actively supported by the development of artificial intelligence, cloud solutions, and personalized learning, making the industry high-tech and promising. Key trends in the Chinese educational technology market are presented in Figure 2.1.

Revenue in the Online Education market in China shown in Fig.2.1

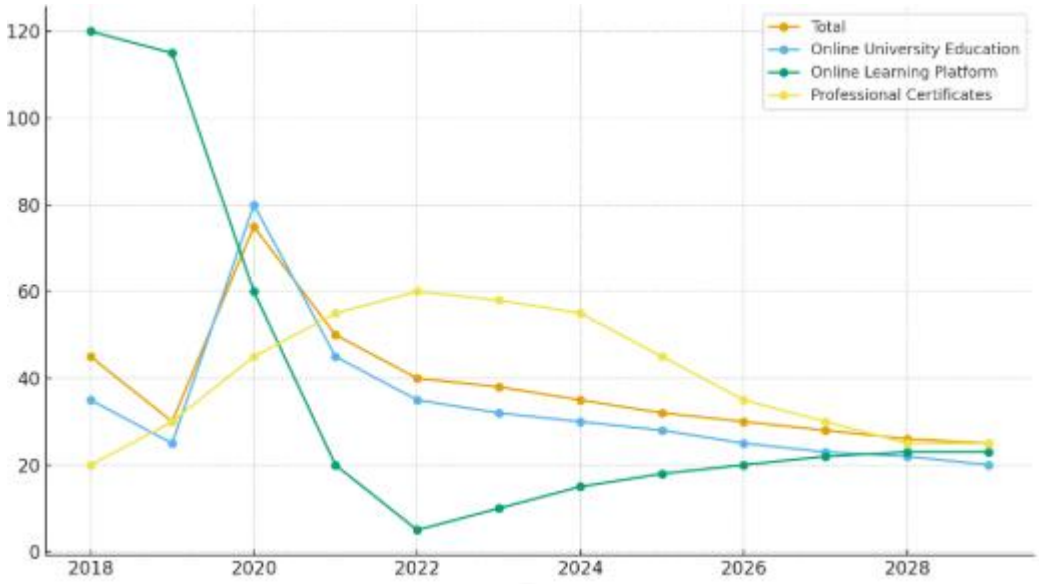

Fig.2.1. Revenue in the Online Education market in China

Source: Statista Market Insights (2024) [53]

The Online University Education segment demonstrated significant growth until 2020, when it peaked, after which it began to decline gradually. This reflects market saturation and increased competition from alternative learning formats. Online Learning Platforms, in contrast, experienced a sharp decline after 2019, likely due to regulatory restrictions and market consolidation. After 2022, the

segment stabilized, showing a moderate recovery, which may indicate a transition to more sustainable and high-quality online learning models. The Professional Certificates segment demonstrated the most stable growth until 2022. Since then, a gradual decline has begun, but interest in professional courses remains high, driven by growing demand for retraining and digital skills development. Overall, the aggregate indicator (Total) indicates a peak in market growth in 2020, followed by a decline and subsequent stabilization at a more sustainable level. This reflects the industry's transition from a phase of rapid expansion to a maturity stage where the focus is on content quality, technology integration, and the long-term sustainability of educational platforms.

Key trends in the educational technology market include:

1. Growing demand for flexible and personalized learning formats

The online education market in China is experiencing steady growth thanks to changing user preferences. Today's learners prefer flexible and personalized formats that allow them to study at their own pace and combine their studies with professional activities. In a highly competitive labor market, more and more people are seeking to improve their qualifications and acquire new skills. Online platforms offering access to courses from leading global universities are becoming an effective tool for self-development and career advancement.

2. The spread of massive open online courses (MOOCs)

One of the leading trends in market development has been the proliferation of massive open online courses (MOOCs). These courses, offering free or low-cost instruction, contribute to the democratization of education, making it accessible to a wider audience. MOOCs offer opportunities for lifelong learning, allowing people to regularly update their knowledge and adapt to changes in the labor market.

3. Active involvement of the corporate sector

Interest in online education is growing among companies recognizing the need for continuous staff development in the digital economy. Corporate online training programs allow organizations to tailor training courses to their needs, developing the competencies needed to improve business efficiency and competitiveness.

4. Overcoming regional educational imbalances

China faces an uneven distribution of educational resources between urban and rural areas. Online education is becoming an important tool for reducing this gap. Through online platforms, residents of remote areas gain access to high-quality educational materials and professional training, helping to equalize educational opportunities across the country.

5. Influence of macroeconomic and political factors

China's rapid economic growth, rising incomes, and emerging middle class are stimulating investment in education and self-improvement. Government support for the digital economy and the promotion of lifelong learning are creating favorable conditions for the development of the online education sector.

By the end of 2025, China's online education market revenue is expected to reach US$45.35 billion. This forecast reflects the sector's robust growth, driven by a desire for flexible and personalized learning experiences, the active adoption of digital technologies, and the growing demand for professional skills development in a rapidly changing labor market. The influence of factors such as the proliferation of mobile platforms, artificial intelligence, and interactive educational solutions is making online education increasingly attractive and accessible to a wide range of people. The platforms, systems, and tools widely used in higher education in China are presented in Table 2.2 and Appendices A-C.

Table 2.2

EdTech in China

Digital educational technologies	Platforms, systems, tools
Massive open online courses (MOOCs)	XuetangX, Chinese University MOOC, Zhihuishu, CNMOOC, Xue Yin Online, Chinese MOOCs, UOOC Online, Zhejiang Provincial MOOC Platform, E-Huixue, CQOOC, Rong You, Xue Tang, Ulearning, ICVE MOOC College, ICC, ErYa, Gaoxiaobang, PMPHMOOC, UMOOCs, iLab-X, MOEC, Educoder, eWant, ShareCourse, OpenEdu
Learning Management Systems (LMS)	Alibaba Cloud, Hujiang, Squirrel AI, New Oriental Education, Tal Education, DingTalk, Cloud Academy, iCourse, Baidu, Tencent, NetEase, Wisdom Education, Yuanfudao
Content authoring tools	MOOC Creator (iCourse), XuetangX Authoring (学堂在线), Zhihuishu Course Designer (智慧树课程设计器), Rain

	Classroom Authoring (雨课堂课程制作), CNMOOC Content Creator (中国慕课课程创作)
Assessment and Testing Systems	ExamOnline (考试在线), YouTestMe, Pointerpro, TAO Platform, Classtime
Learning Analytics / Big Data	Transwarp (传智云图), PingCAP (平头哥), Yimian Data (亿面数据), Weimai Technology (微脉科技), Hangzhou Fanwen Science and Technology (杭州泛文科技)
Collaboration tools	DingTalk (钉钉), WeCom (企业微信), Feishu (飞书), Lark (飞书), Huawei Cloud WeLink (华为云WeLink)
Artificial intelligence technologies	DeepSeek-V3.2-Exp, Qwen 2.5-Max (Alibaba Cloud), Doubao 1.5 Pro (ByteDance), Kimi K1.5 (Moonshot AI), GLM-4 Plus (ChatGLM, Zhipu AI), WuDao 3.0
Virtual reality, augmented reality, and mixed reality technologies (VR/AR/MR)	iLab-X (Higher Education Press), Zhiyuan VR Lab, AREdu, ClassIn AR, HoloEdu, Tencent MR Lab, XuetangX VR/AR Lab, Squirrel AI AR/VR, Aliyun Cloud VR/AR, Huawei Cloud Immersive Learning
Digital Gamification (GamEd)	ClassIn Game-based Modules, XuetangX Gamification Tools, Squirrel AI Gamified Learning, iHuman Edu Games, Zuoyebang Learning Games, Tal Education Gamified Modules

Source: self-developed

Massive open online courses (MOOCs)

In China, massive open online courses (MOOCs) have become an important tool for modernizing higher education, providing broad access to educational resources and expanding opportunities for independent learning. Platforms such as XuetangX, Chinese University MOOC, Zhihuishu, CNMOOC, and Xue Yin Online provide students with interactive courses in a wide range of disciplines, from science to humanities and social sciences. UOOC Online, Zhejiang Provincial MOOC Platform, E-Huixue, and CQOOC enable universities to integrate online courses into their programs, providing flexible learning and support for students at all stages of the educational process. Additionally, the platforms Rong You, Xue Tang, Ulearning, ICVE MOOC College, ICC, ErYa, Gaoxiaobang, and PMPHMOOC offer educational content developed in collaboration with universities and industry experts, while UMOOCs, iLab-X, MOEC, Educoder, eWant, ShareCourse, and OpenEdu provide access to specialized courses, virtual labs, and practice-oriented projects. Together, these platforms create a dynamic educational environment where

students can independently plan their studies, take courses from leading Chinese universities, and gain relevant knowledge that meets the demands of the modern labor market.

Learning Management Systems (LMS)

The learning management system (LMS) market in China is experiencing rapid growth, with its size projected to increase from $1.42 billion in 2024 to $8.88 billion by 2035. The compound annual growth rate (CAGR) for this period is estimated at 18.13%, demonstrating high dynamism and sustainable demand for innovative educational technologies. Key drivers of market growth are the active adoption of digital solutions and the growing focus on online learning, which is gradually becoming an integral part of China's educational ecosystem. With the growing demand for personalized and flexible learning, LMS features are rapidly evolving to accommodate diverse educational needs and learning styles. The trend toward blended learning formats observed in recent years has prompted companies and educational institutions to integrate LMS platforms into their processes. The primary driver for this shift is the need to provide flexible learning formats that combine online and offline components, which has become particularly evident during the COVID-19 pandemic. Furthermore, the proliferation of mobile learning is changing the way learners access educational content, prompting LMS developers to adapt their solutions for mobile devices. Significant growth potential for the LMS market in China is also linked to the development of distance education systems in remote and rural regions, where access to modern educational technologies remains limited. Incorporating culturally relevant content and local language support into LMS materials improves efficiency and user engagement, opening up new opportunities for market expansion. Key trends include the implementation of AI, data analytics, and improved user experience. The Chinese LMS market is developing under the influence of leading technology and education companies. Alibaba Cloud and DingTalk provide cloud infrastructure and enterprise learning solutions, while Hujiang and Squirrel AI are promoting personalized and AI-driven learning models. New Oriental Education, TAL Education, and Mango Education

are developing digital and hybrid educational formats. Cloud Academy and iCourse support higher education through online platforms and virtual courses. Tech giants Baidu, Tencent, and NetEase are integrating AI and big data into LMS systems, increasing their efficiency. Wisdom Education, Xueersi, and Yuanfudao are strengthening their positions in online learning and tutoring. Together, they are forming an innovative and competitive digital education ecosystem in China (Dhapte, A., 2025). Thus, the dynamic interplay between changing educational needs and technological innovation is shaping a new structure of the Chinese LMS market, creating a solid foundation for its further development.

Content authoring tools

In China, there are several tools specifically designed for creating online courses and educational content. MOOC Creator (iCourse) allows universities to create video lessons, quizzes, and interactive assignments, supporting multimedia formats and discussion forums. XuetangX Authoring (学堂在线) allows instructors to design interactive lectures that include multimedia, testing, and student performance analytics. Zhihuishu Course Designer (智慧树课程设计器) is focused on the creation of video lessons, independent materials and interactive modules, providing a full cycle of course authoring. Rain Classroom Authoring (雨课堂课程制作) is integrated with PowerPoint and WeChat, allowing you to create interactive slides with polls, assignments, and real-time feedback. Finally, CNMOOC Content Creator (中国慕课课程创作) provides a national tool for developing courses with videos, quizzes, and interactive modules, supporting mass learning on the MOOC platform. All these tools are aimed at improving the quality of educational content and making course creation easier for instructors.

Assessment and Testing Systems

In China, there are a number of independent companies and platforms specializing in online assessment and testing, which are actively used in educational

and corporate environments. For example, ExamOnline (考试在线) provides tools for test creation, automated assessment, and remote proctoring using artificial intelligence, making it popular for entrance examinations and certification procedures. YouTestMe enables educational institutions and companies to create, administer, and analyze tests, ensuring convenient and transparent assessment. Pointerpro focuses on automating online assessments and surveys with personalized reports, which is especially relevant for HR and consultants. The TAO platform offers flexible options for customizing questions, administering tests, and analyzing results, while Classtime provides comprehensive online assessment support with a focus on monitoring student performance. All these solutions are independent, highly automated, and tailored to the specifics of the Chinese educational market, improving the quality of education and the objectivity of assessment.

Learning Analytics / Big Data

In China, companies specializing in data analysis and the implementation of big data technologies in education are actively developing, offering solutions for educational institutions, government agencies, and businesses. For example, Transwarp (传智云图) from Shanghai provides cloud solutions and big data consulting, helping to effectively manage information flows and improve educational processes. PingCAP (平头哥) from Beijing offers managed IT services and analytics platforms that optimize the processing of large amounts of data. Yimian Data (亿面数据) from Shenzhen uses artificial intelligence to create personalized educational programs and evaluate their effectiveness. Weimai Technology (微脉科技) and Hangzhou Fanwen Science and Technology (杭州泛文科技) develops solutions that analyze student performance and create individualized learning paths. Together, these companies form an innovative Learning Analytics ecosystem in China, helping to improve the quality of education,

accuracy, and knowledge assessment and effective management of educational processes in the context of digital transformation.

Collaboration tools

China is rapidly developing collaboration platforms tailored to the specifics of the local market, including tight integration with popular messaging apps and enhanced corporate security requirements. Among the leading solutions, DingTalk is worth noting.钉钉) from Alibaba Group, which integrates chat, video conferencing, task management and document management and is widely used in government agencies and large corporations WeCom (企业微信) from Tencent, integrated with WeChat, provides corporate communication, supporting messaging, video calls, and project management. The Feishu platform (飞书) from ByteDance combines chat, video conferencing, calendars and document collaboration, and its international version, Lark (飞书) is oriented to the global market, providing similar functionality for teamwork. Finally, Huawei Cloud WeLink (华为云WeLink offers comprehensive enterprise communications solutions including video conferencing, messaging and task management, making it convenient for large organizations and enterprises striving for digital transformation.

Artificial intelligence technologies

China is actively developing cutting-edge AI models that are finding application in academia and university research. DeepSeek-V3.2-Exp excels at processing large text arrays thanks to sparse attention and optimization for Chinese Ascend and Cambricon processors, making it popular in scientific labs. Alibaba Cloud's Qwen 2.5-Max combines NLP and code generation capabilities with open access for researchers, supporting university projects in machine learning and natural language processing. ByteDance's Doubao 1.5 Pro is a high-performance model for text generation and data analysis, widely used in education and research. Moonshot AI's Kimi K1.5 can process text corpora of up to 200,000 characters,

making it ideal for educational and scientific projects involving large-scale data. Zhipu AI's GLM-4 Plus (ChatGLM) boasts flexibility and an open architecture, allowing it to be integrated into university experiments and practical applications of generative AI. Finally, WuDao 3.0, developed by the Beijing Academy of Artificial Intelligence, is a multimodal model with 1.75 trillion parameters capable of processing text, images, and other data, making it a valuable tool for complex academic research and multimodal analysis.

Virtual reality, augmented reality, and mixed reality technologies (VR/AR/MR)

Virtual reality (VR), augmented reality (AR), and mixed reality (MR) technologies are rapidly developing in China, finding widespread application in university education. The iLab-X platform (Higher Education Press) offers students virtual laboratories in physics, chemistry, and biology, allowing them to safely conduct experiments and integrate theoretical knowledge with practical skills. Zhiyuan VR Lab creates immersive VR content for historical and cultural tours, as well as for visualizing educational materials, enhancing student engagement. ClassIn AR and AREdu focus on augmented reality, providing interactive tutorials and tools for online classes that help tailor learning to individual student needs. HoloEdu and Tencent MR Lab are developing mixed reality, combining digital objects with real-world environments for educational simulations, international programs, and research projects. Additionally, the XuetangX VR/AR Lab, Squirrel AI AR/VR, Aliyun Cloud VR/AR, and Huawei Cloud Immersive Learning platforms provide universities with cloud-based solutions for interactive courses, personalized learning, and remote labs. These technologies not only empower faculty and students but also create a new educational environment where learning becomes more hands-on, interactive, and immersive.

Digital Gamification (GamEd)

In China, digital gamification (GamEd) is being actively implemented in university education, transforming learning into an interactive and engaging process. The ClassIn platform integrates game elements directly into online classes, using

points, badges, and quests to increase student engagement. XuetangX offers gamification tools, including levels, rankings, and progression systems, allowing teachers to effectively track student progress in STEM and humanities. Squirrel AI emphasizes personalized learning, adapting game tasks to each student's level and supporting individual progress in mathematics, physics, and programming. iHuman Edu Games provides interactive simulations and virtual labs for medicine, biology, and engineering, giving students the opportunity to practice in a safe digital environment. Additionally, the Zuoyebang and Tal Education platforms apply gamification to homework, tests, and team competitions, fostering collaboration and competition. Together, these solutions create an educational environment where theory and practice are combined with game elements, increasing student motivation and the effectiveness of university learning.

Thus, modern higher education in China is seeing the comprehensive implementation of innovative educational technologies, significantly expanding the capabilities of faculty and students. Massive open online courses (MOOCs) provide access to high-quality educational materials and allow students to independently shape their learning paths. Learning management systems (LMS) and content authoring tools enable universities to organize effective learning processes and develop interactive educational materials. Assessment and testing systems, coupled with learning analytics and big data, enable student progress tracking, personalized learning, and data-driven decision-making. Collaborative learning tools promote teamwork and communication skills development, while artificial intelligence technologies automate knowledge analysis, support adaptive learning, and create intelligent educational platforms. Meanwhile, VR/AR/MR technologies provide immersive and hands-on learning, allowing for the simulation of laboratory experiments and complex processes in a safe environment. Digital gamification (GamEd) makes learning more motivating and engaging by integrating game mechanics into the educational process. Together, these technologies create a modern educational ecosystem where learning becomes interactive, personalized,

and practice-oriented, enhancing the effectiveness of university education and preparing students for the challenges of a rapidly changing world.

2.2. Analysis of Learning Management System Implementation in Chinese Higher Education

This study analysed the experience of implementing digital technologies in 5 universities in China, namely: Tsinghua University (Beijing), Peking University (Beijing), Zhejiang University (Zhejiang), Shanghai Jiao Tong University (Shanghai), Fudan University, Shanghai.

Tsinghua University, Beijing

Online education is a key strategic development area for Tsinghua University. On October 10, 2013, the university launched its massive open online course (MOOC) platform, XuetangX, and introduced its first five courses. Today, the platform hosts over 380 online courses, with a total enrollment of over 21 million. Following the COVID-19 outbreak in spring 2020, Tsinghua transitioned its entire curriculum to an online format, and a hybrid teaching model combining online and offline formats was implemented in the fall semester. Tsinghua's online education goal is to build an open, integrative, and sustainable university that provides accessible and high-quality education for all. In fall 2021, Tsinghua University, as a founding member and secretariat of the Global MOOC Alliance, launched seven international open online courses. These courses are taught in English and are available to students worldwide both online and offline. Students can choose topics of interest, participate in interactive online discussions, and watch live lectures through the international version of XuetangX and Tsinghua University's official social media accounts. This initiative aims to develop global hybrid education by providing students from partner universities with the opportunity to attend top university courses without the obligation to earn credits, thereby expanding academic collaboration and access to knowledge. Founded by Tsinghua University, XuetangX also serves as the research and application centre of the Online Education Research Centre of the Chinese Ministry of Education. It is also one of the first

projects of the National Innovation and Entrepreneurship Program, serves as the Deputy Secretary-General of the China Association for Higher Education, and serves as an online platform for UNESCO ICEE. In 2020, XuetangX was among the first international university online platforms approved by the Chinese Ministry of Education [55].

Peking University, Beijing

Peking University (PKU) is one of the leading centers of innovation in online education in China. In December 2020, the university, in partnership with Offcn Education, launched its own digital educational platform, PKU Academy (iPKU.com). It brings together a wide range of formats, including open online courses, certificate programs, intensive bootcamps, classical academic disciplines, and interest-based courses. The platform aims to meet the growing educational needs of society and promote the concept of lifelong learning. PKU was one of the first Chinese universities to join the MOOC movement: back in 2014, the university began collaborating with Coursera, providing open courses for students and faculty. This experience allowed the university to quickly adapt to the 2020 pandemic, when the entire educational process was transferred online. Live online lectures, recorded materials, webinars, as well as PKU's LMS systems and external MOOC platforms were introduced. The university's proprietary LMS, TEACHING AND LEARNING@PKU (course.pku.edu.cn), occupies a special place. It facilitates the uploading of course materials, the organization of homework, interactive interaction between students and instructors, and the recording and viewing of lectures. The university actively utilizes external platforms (including Coursera) to expand its reach and international presence. PKU demonstrates a high degree of flexibility and readiness for change: during crises, the university was able to quickly scale up online learning and implement hybrid and blended formats while maintaining the quality of the educational process. Particular attention is paid to faculty training, methodological support for students, and quality assurance. Furthermore, Peking University actively participates in international alliances and initiatives in online

education, facilitating the exchange of experience and integration into the global educational space [42].

Zhejiang University, Zhejiang

Zhejiang University (ZJU) is a leader in digital and online education in China, actively implementing innovative learning technologies. The university was one of the first to integrate MOOC platforms and learning management systems (LMS) into the educational process, creating an open, flexible, and technologically advanced learning ecosystem. ZJU launched its own online platform, Zhihuishu, and participates in national educational platforms such as XuetangX and CNMOOC, offering a wide range of courses based on digital technologies. Today, the university offers hundreds of online courses, including interdisciplinary programs and specialized courses in English, allowing students worldwide to access high-quality education. During the COVID-19 pandemic, Zhejiang University has become one of China's model universities for distance learning. In just a few weeks, ZJU transitioned its entire educational process to an online format, leveraging a combination of its own LMS systems, video conferencing, MOOC platforms, and digital collaboration tools. The university also developed teaching materials and conducted extensive faculty training to effectively utilize online learning technologies. Today, ZJU actively promotes the concept of blended learning, integrating traditional and digital formats. The university's LMS system not only manages educational content and assignments but also provides analytical monitoring of academic performance and supports adaptive learning using elements of artificial intelligence. Much attention is paid to the quality of teaching, digital literacy of teachers, and inclusiveness and equal access to digital resources. The university collaborates with global partners and participates in international online education alliances, promoting open and lifelong learning for all. Thus, ZJU demonstrates a strategic vision in developing the digital transformation of education, successfully [73].

Shanghai Jiao Tong University, Shanghai

Shanghai Jiao Tong University (SJTU) is one of China's leading universities actively developing digital education and integrating online technologies into the educational process. The university plays a key role in promoting online learning, MOOC platforms, and learning management systems (LMS), striving to make education more flexible, open, and innovative. SJTU was one of the first to join the national platform XuetangX and also launched its own online learning system, "SJTU Online," which includes open online courses, professional programs, and resources for faculty. The university has developed over 400 online courses (MOOCs) available to students worldwide, including through international platforms such as edX and Coursera. During the COVID-19 pandemic, Shanghai Jiao Tong University quickly and effectively transitioned its entire educational process to an online format. The university's LMS platform has become the primary tool for organizing lectures, homework, tests, and feedback between faculty and students. SJTU has also implemented hybrid learning models, combining online and offline formats, which has helped maintain a high level of academic engagement. Particular attention is paid to the quality of online learning and faculty support: the university conducts regular training sessions on the use of LMS, digital tools, and distance teaching methods. Students are provided with self-study resources, video recordings of lectures, and interactive forums for knowledge sharing. SJTU is also actively exploring the potential of artificial intelligence and big data in education. The university's LMS systems integrate analytics and learning personalization features, allowing the learning process to be tailored to the needs of each student. Furthermore, Shanghai Jiao Tong University is a member of the Global MOOC Alliance and collaborates with leading global universities to share best practices and expand access to high-quality education. SJTU thus exemplifies a strategic approach to digital transformation in education, combining advanced technologies, flexible learning formats, and a focus on international cooperation [49].

Fudan University, Shanghai

Fudan University (Shanghai) is actively developing online education and integrating digital technologies into the educational process. The university has

implemented an internal eLearning platform that facilitates the distribution of course materials, online classes, testing, and student-faculty interaction. During the COVID-19 pandemic, Fudan moved over 2,600 undergraduate courses online, ensuring learning continuity and academic support. Particular attention is paid to the use of artificial intelligence technologies in education. In collaboration with Huawei, Fudan developed the "Medical Artificial Intelligence and Machine Learning" course, the first in China to focus on the application of AI in medicine. The university is also expanding its range of AI-related disciplines and, in recent years, has launched an initiative to create over 100 AI-based courses for students in various fields. Fudan actively promotes blended and hybrid learning formats, improves its LMS infrastructure, and strives to create an integrated educational ecosystem where digital technologies, data analytics, and AI are used to personalize learning and enhance its quality [19]

The overall trends of online learning, LMS, MOOCs, and AI initiatives in leading universities in China are presented in Table 2.3.

Table 2.3

General trends in online learning, LMS, MOOCs, and AI initiatives at leading universities in China

University	Online platform / LMS	MOOCs	Application of AI	Hybrid learning	International cooperation
Tsinghua University, Beijing	XuetangX (proprietary platform), internal LMS	380+ MOOCs, Global Open Courses	GenAI Integration for Education and Research	Online, hybrid	Member of the Global MOOC Alliance
Peking University, Beijing	PKU Academy / iPKU.com, TEACHING AND LEARNING@PKU	MOOCs on Coursera, internal courses	Supporting personalized learning	Online, hybrid	International platforms, exchange of experience
Zhejiang University, Zhejiang	ZJU Online / LMS	400+ MOOCs, international courses in English	AI classes, data analysis tools	Online, hybrid	Collaboration with foreign universities and MOOC platforms
Shanghai Jiao Tong University, Shanghai	SJTU Online / LMS	MOOC platform and internal courses	Using AI to analyze training data	Online, hybrid	International exchange programs and MOOCs
Fudan University, Shanghai	eLearning / internal LMS	100+ AI courses and MOOCs on	AI for Personalization,	Online, hybrid	Global MOOC Partnerships

		Chinese and international platforms	Medical AI Course		

Source: compiled based on data [19], [55], [49], [42], [73].

General trends in online learning, LMS, MOOCs, and AI initiatives in China's higher education highlight a rapid shift toward intelligent, data-driven learning ecosystems. Universities are actively implementing digital platforms that support interactive, flexible, and personalized study experiences. The growth of MOOCs has expanded educational access beyond national borders, promoting global knowledge exchange and lifelong learning. Artificial intelligence technologies are being applied to optimize teaching strategies, monitor student engagement, and enhance learning outcomes. Collectively, these trends illustrate a transformative move toward a more innovative, inclusive, and future-oriented model of digital education.

2.3. Barriers to Implementation, Technological Limitations, and Potential Areas for Improvement.

Digital educational technologies hold enormous potential for improving the quality of educational services provided by higher education institutions. However, questions remain about their effective use and the full realization of their potential. To identify barriers and opportunities for integrating digital tools into the educational process, an online survey was conducted among 37 educators from five higher education institutions: Tsinghua University (Beijing), Peking University (Beijing), Zhejiang University (Zhejiang), Shanghai Jiao Tong University (Shanghai), and Fudan University (Shanghai). The survey was conducted using Tencent Docs. The survey results are presented in Table D.1 in Appendix D. A five-point Likert scale was used.

According to the results of a survey of Chinese university teachers, the most significant barriers to the implementation of projects to introduce digital technologies into the educational process are financial barriers, with which 94% of respondents fully agreed, lack of support for additional efforts of teachers, which

leads to a decrease in motivation − 91% and resistance to technology among teachers - 86% (See Fig. 2.2).

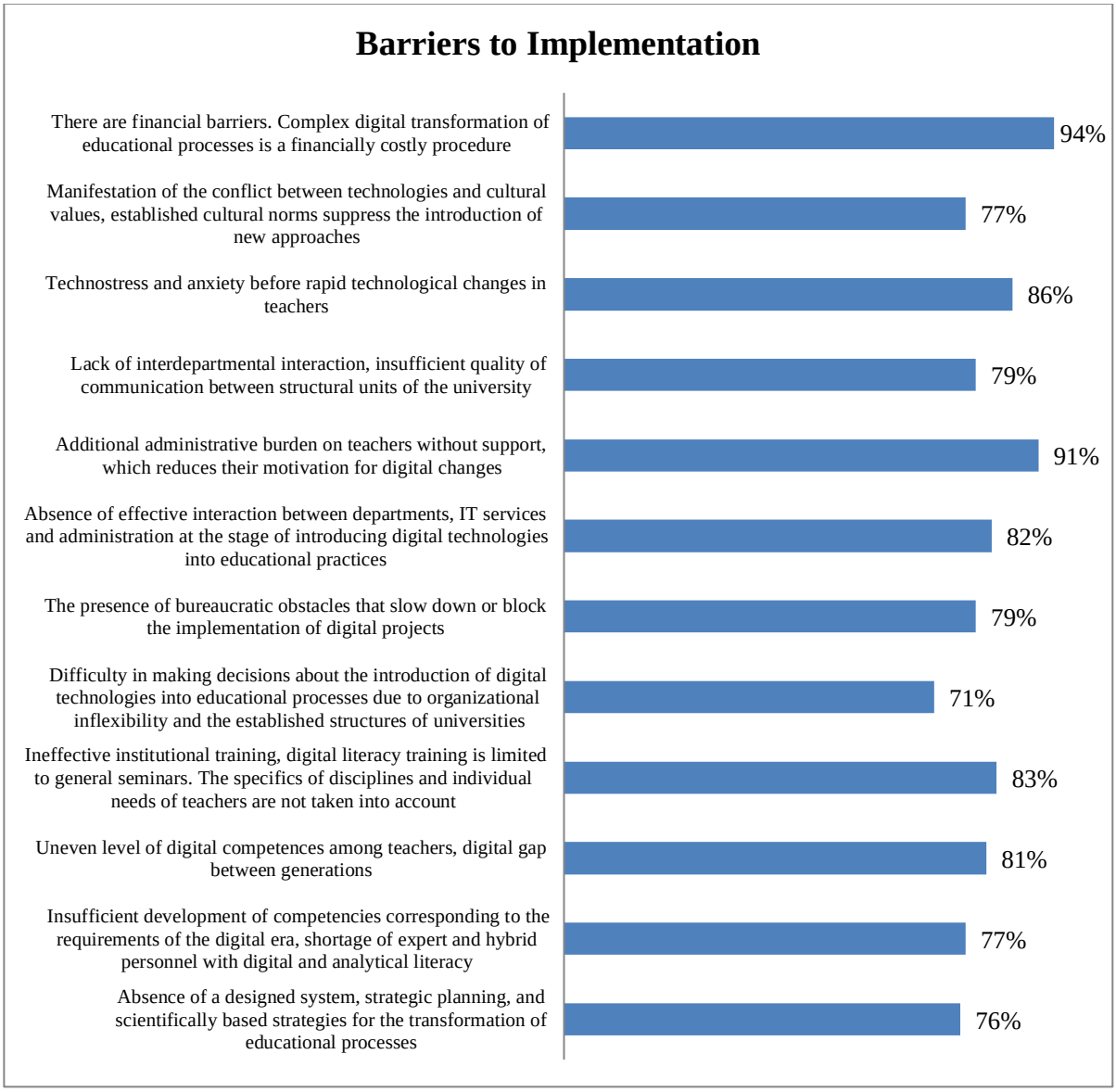

Fig. 2.2. Barriers to Implementation of digital technologies in learning
Source: self-developed

The key technical difficulties in using technology, according to teachers, include insufficiently developed infrastructure (97%), limitations in the adaptability of online learning platforms (97%), interruptions in the operation of platforms (97%), a lack of flexible content creation tools (96%), and a lack of appropriate skills for working with digital technologies (94%) (See Fig. 2.3).

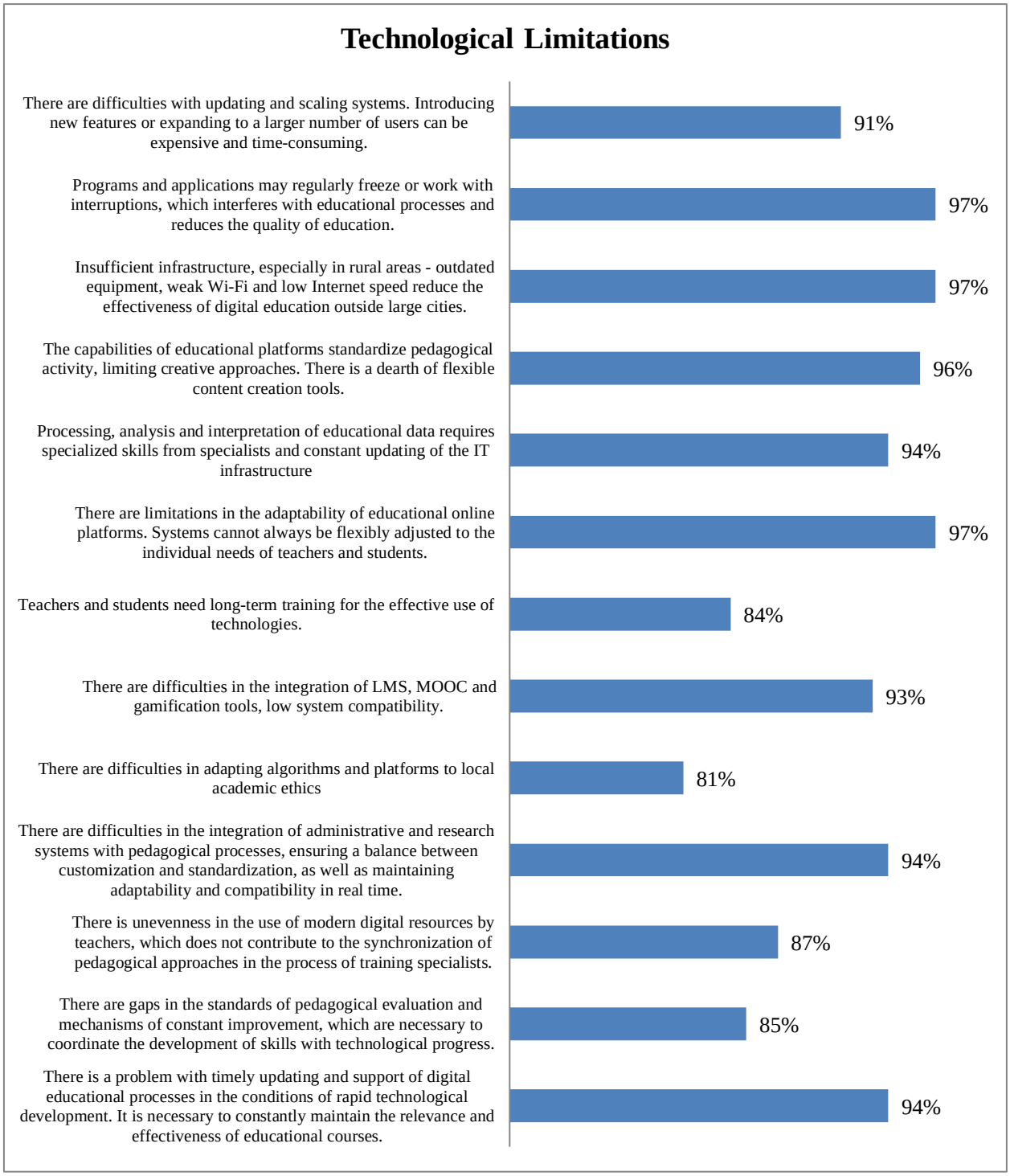

Fig. 2.3. Technological Limitations of digital technologies using in learning
Source: self-developed

The survey identified key areas for improving educational processes using digital technologies. Ninety-eight percent of respondents believe it is necessary to integrate generative AI and data analytics into learning management systems to enhance the personalization of the educational process and the efficiency of working with educational data. Ninety-eight percent of respondents confirmed the need to

modernize infrastructure, including updating networks, VR/AR labs, and server hardware to ensure stable technology operation. Ninety-seven percent of educators believe it is necessary to create an integrated ecosystem − combining LMS, MOOCs, VR/AR, and AI platforms into a single system for seamless interaction and data exchange. Ninety-six percent of respondents believe it is necessary to continually improve digital, information, and AI literacy, and provide systematic training on how to use new technologies and analytical tools (see Fig. 2.4).

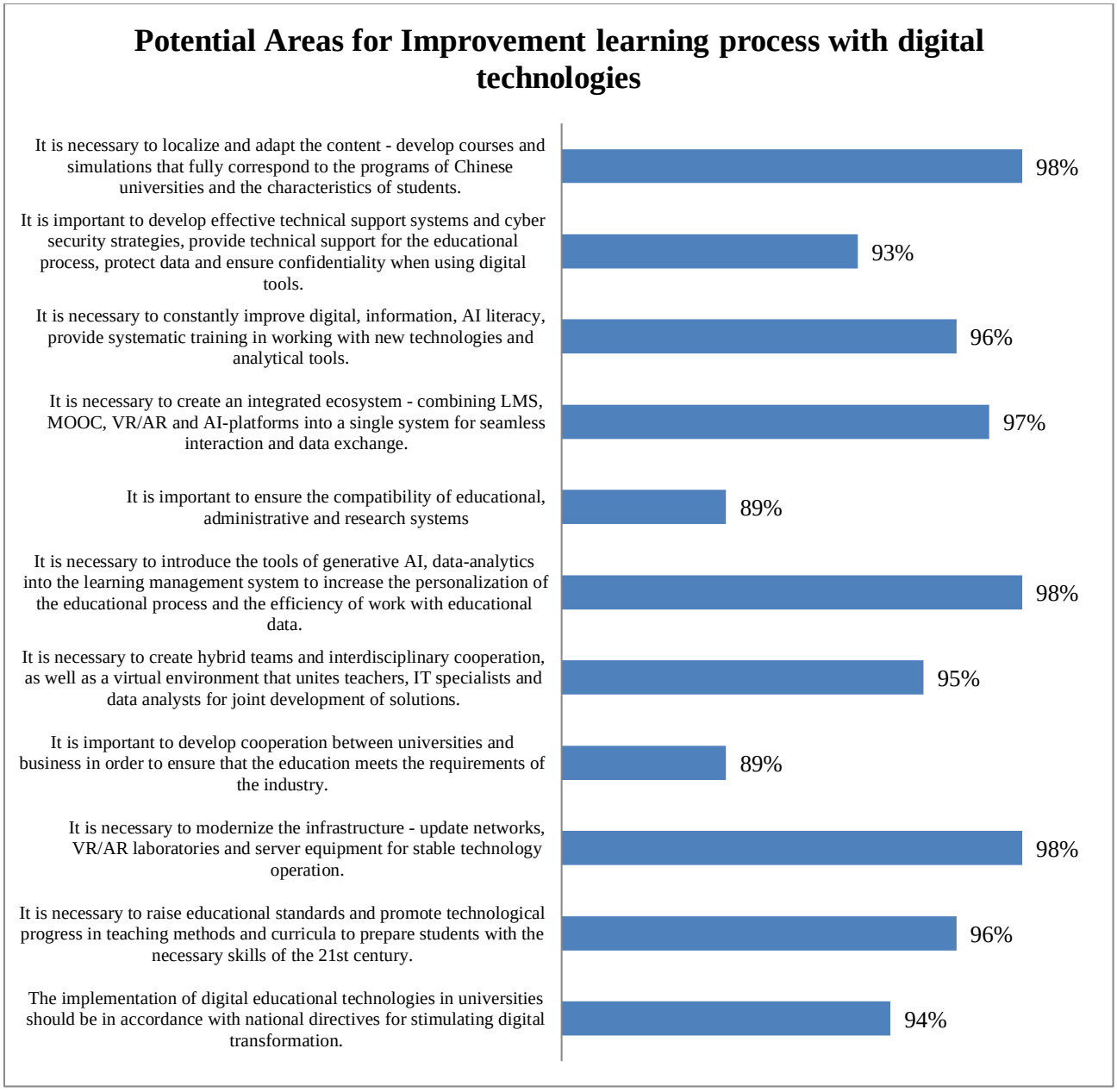

Fig.2.4. Potential Areas for Improvement learning process with digital technologies

Source: self-developed

The implementation of modern educational technologies in Chinese universities is opening up new opportunities for interactive and personalized learning. However, this process faces a number of obstacles and technological limitations that impact the effectiveness of their use. The survey results identified key barriers to implementation, technological limitations, and potential areas for improvement (See Fig. 2.5).

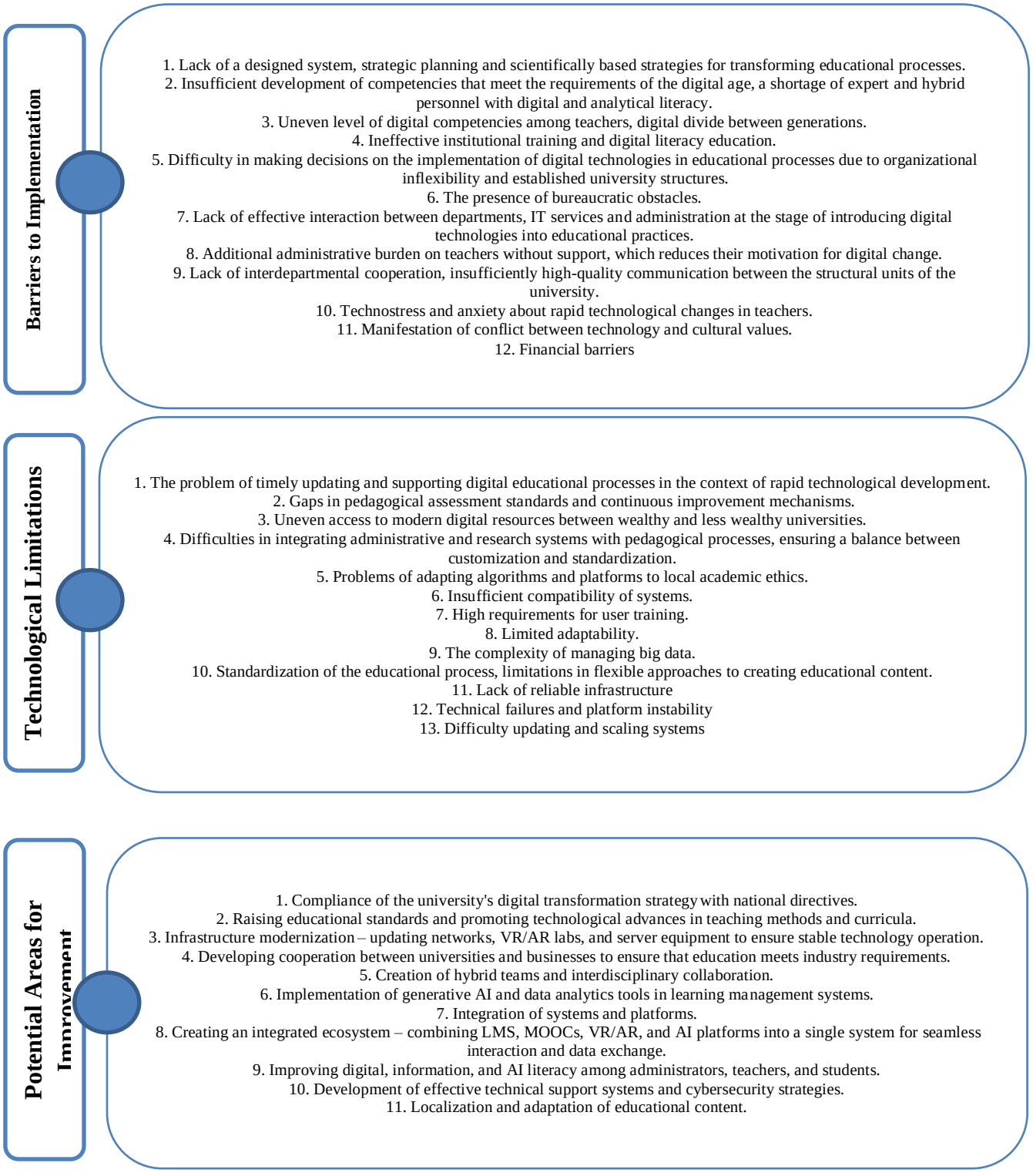

Fig. 2.5. Barriers to Implementation, Technological Limitations, and Potential Areas for Improvement

Source: self-developed

China, like many other countries, is implementing the digital transformation of education through a comprehensive strategy encompassing policy support, infrastructure development, research, and technology assessment. Policy initiatives set development directions, resource provision ensures the creation of digital platforms and content, and research enables the engagement of educational stakeholders and enhances the effectiveness of technologies. A technology assessment system, in turn, forms the basis for adjusting policy and practice based on reliable data. All these elements are interconnected and form a holistic model for the digital modernization of education.

Current Trends in China's Higher Education System [16]:

1. Policy support: high-level strategic planning

Political support is a key factor in the digital transformation of education. The state provides institutional guarantees by developing strategic plans, regulatory norms and standards for educational technologies, and creating effective governance and oversight mechanisms. The government systematically promotes initiatives to improve the digital literacy of teachers and students, develop learning communities, and modernize education management. These measures form a long-term strategy that views digital education as a key tool for national development and building a lifelong learning society.

2. Resource support: expansion of digital educational resources

Digital educational resources are the foundation of sustainable digital transformation. They include infrastructure, equipment, software tools, educational materials, and platforms, enabling the development of intelligent learning, management, and services.

In 2021, the Chinese Ministry of Education published the "Guiding Opinions on the Construction of a New Generation Education Infrastructure." The document

outlined the guidelines for developing a world-class digital educational infrastructure, encompassing:

- information networks and platform systems;
- digital content and smart campuses;
- innovative applications.

The key focus is on the transition from quantitative growth to improving the quality of infrastructure.

The National Intellectual Education Platform has undergone five stages of modernization. Its functionality has been expanded, including a unified search system, personalization options (likes, favorites, reposts), and accessibility for special groups, including older users.

China aims to transform the National Intelligent Education Platform into a multi-tiered system that integrates national and international resources and provides personalized learning for all. China is focusing its efforts on:

- integration of domestic and foreign educational resources;
- expanding courses in STEM, IT, arts and vocational skills;
- development of digital textbooks, manuals, virtual simulations and project materials;
- implementation of innovative mechanisms for assessing the quality of resources based on big data.

3. Application Testing: Optimizing the Implementation of Educational Technologies

The effectiveness of educational technologies is determined by their application. As part of its digital transformation, China is actively investing in pilot and demonstration projects, developing innovative technology application scenarios based on both national and international experience.

Main directions of experiments

- Interclass interaction: creating mechanisms for consistent data exchange across all stages of learning and in different settings.

- Diversification of learning models: transition from the traditional classroom to a blended format that combines online and offline learning, in-person and extracurricular activities.
- Platform promotion: development of specialized platforms for the dissemination of high-quality teaching methods and materials.

4. Expanding digital opportunities: increasing the digital competence of educational participants

Modern digital technologies place new demands on the education system. Improving the digital literacy and competence of teachers and students is becoming a key condition for the successful digital transformation of education. Without proper training in this area, mastering complex technological tools and reforming educational paradigms is impossible.

Key measures to expand digital opportunities include:

1. Developing digital literacy among teachers
    - Creation of comprehensive training programs.
    - Integration of preliminary and continuous training.
    - Regional adaptation.
2. Using digital resources for faculty and student growth
    - Smart learning environment: Working on campuses with modern equipment, network terminals and smart infrastructure promotes the spontaneous accumulation of digital literacy skills.
    - Educational platforms: The use of applications and platforms such as the National Intelligent Education Platform and AI systems for teachers stimulates innovation in teaching methods and the integration of technology into interdisciplinary practices.
3. Integration of technologies to implement innovative learning models

The active use of digital tools in the educational and teaching process promotes the development of innovative approaches to learning, improves digital

literacy, and equips students and teachers with the skills necessary for successful work in a digital society.

5. Digital Assessment: Strengthening Monitoring and Evaluation of Digital Education

Digital technologies are fundamentally changing approaches to educational assessment. The use of big data and artificial intelligence allows us to address the challenges of traditional methods, such as the lack of uniform standards, ensuring more accurate and comprehensive measurement of learning outcomes.

Creating a comprehensive assessment system:

1. Integrating data and analytics: Combining the results of large-scale assessments with multimodal data analytics creates a system that can provide real-time feedback and track the digital transformation process over time.

2. Standardized indicators: The development of agreed indicators and the creation of reliable databases expand decision-making capabilities in the educational sector.

The Chinese government adheres to the principle of "digital for good," emphasizing research into the ethical aspects of AI, scientific assessment of the impact of intelligent technologies on education, and the rational use of innovative tools.

Conclusions to Section 2

China has entered a new digital era, leading to a profound transformation of education. Big data, AI, and multimedia are being actively integrated into the educational process, changing approaches to learning and management. Digital education fosters new competencies and digital literacy, becoming the foundation of systemic transformation. It improves the quality and accessibility of education, facilitates the development of flexible models−from blended learning to flipped classrooms—and strengthens the resilience of the education system to modern challenges. Key trends in the edtech market include growing demand for flexible and personalized learning formats, the expansion of massive online courses

(MOOCs), active corporate participation, a desire to eliminate regional imbalances in educational access, and the influence of macroeconomic and political factors on the development of the EdTech sector.

To identify barriers and opportunities for integrating digital tools into education, an online survey was conducted among 37 faculty members from five leading Chinese universities. The results revealed that the main barriers to implementing digital technologies included a lack of a systematic approach and strategic planning, a shortage of digital competencies and qualified personnel, uneven levels of digital literacy among faculty, institutional unpreparedness, and bureaucratic complexities. Organizational rigidity, poor collaboration between departments, increased administrative workload, technostress, a conflict between technology and cultural values, and financial constraints were also noted.

Key technical challenges identified by educators include issues with updating and maintaining digital processes in the face of rapid technological advancement, gaps in pedagogical assessment and improvement standards, and uneven access to modern resources across universities. Additional difficulties include integrating administrative, research, and teaching systems, adapting platforms to local academic ethics, system incompatibility, high user training requirements, and limited technology adaptability. Educators also cited difficulties in managing big data, standardization that reduces flexibility, insufficient infrastructure, technical glitches, and difficulties scaling digital solutions.

The survey identified key areas for improving educational processes using digital technologies. Priorities included aligning universities' digital transformation strategies with national guidelines, raising educational standards, and upgrading infrastructure, including networks, VR/AR labs, and server hardware. Developing collaboration with businesses, forming hybrid teams, and implementing generative AI and data analytics tools are also crucial. Educators also noted the need to integrate systems and create a unified digital ecosystem, improve digital and AI literacy for all participants in the educational process, enhance technical support, cybersecurity, and adapt content to local conditions.

3. COMPREHENSIVE STRATEGY FOR IMPROVING LEARNING MANAGEMENT SYSTEMS IN HIGHER EDUCATIONOF THE PEOPLE'S REPUBLIC OF CHINA

3.1. Methods and Tools for Incorporating Digital Platforms into Teaching and Learning Processes

The integration of generative AI (GenAI) into learning management systems (LMS) is becoming a strategic step toward transforming the educational process. These technologies enable the creation of personalized learning paths, accelerated feedback delivery, and improved assessment accuracy. GenAI can analyze massive amounts of student progress data, identify learning gaps, and suggest optimal development paths. The introduction of AI into LMSs not only increases student engagement and motivation but also supports instructors in making pedagogically sound decisions, creating a more interactive, adaptive, and effective learning environment. To effectively integrate generative AI (GenAI) into higher education, a set of strategies aimed at modernizing the teaching and research process is proposed (Table 3.1).

Table 3.1

Actionable strategies for integrating GenAI into higher education

Pillar	Focus Areas	Policy Actions	Example Interventions
Governance and strategic planning	Leverage AI potential to shape flexible governance strategies.	Set up AI governance bodies while promoting collaborative, multi-stakeholder decision-making.	Implement periodic assessments of AI policies while promoting collaborative learning networks.
Equity, accessibility, and inclusion	Promote inclusive AI tools that respect culturally diverse contexts.	Create inclusive AI adoption policies and invest in closing the digital divide.	Provide AI solutions in multiple languages while supporting tailored learning for marginalized communities.
Ethics, risk management, regulation	Ensure AI systems are secure, fair, and ethically sound.	Ensure ethics education and enforce protocols for transparency and bias mitigation.	Create governance boards for AI and perform external system evaluations.

Infrastructure and investment	Establish strong foundations for AI adoption with secure systems.	Direct resources toward state-of-the-art AI technologies while upgrading infrastructure.	Develop specialized AI infrastructure and fund collaborative, cross-domain research.
Capacity building and AI literacy	Cultivate AI skills and continuous development for everyone involved.	Deliver targeted learning programs while promoting interdisciplinary AI fluency.	Conduct AI literacy workshops for faculty and researchers, implement peer learning for students, and provide research-focused training on data ethics and reproducibility.
Teaching, learning, and assessment	Integrate intelligent learning tools to improve assessment reliability.	Design AI-enhanced learning programs with transparent rules for GenAI application in evaluation.	Test personalized learning environments and leverage AI to enhance feedback across all assessment types.
Research and knowledge generation	Promote AI-driven discoveries with a focus on reproducibility, bias mitigation, and ethical responsibility.	researchers Support with AI technologies while enforcing transparency and fostering interdisciplinary approaches.	Invest in AI-enhanced research programs, deploy AI-assisted platforms for knowledge exchange, and ensure clear attribution of AI in publications.
Global collaboration a best practices	Promote international collaboration for shared resources and mutual learning.	Develop platforms for international dialogue and mentorship while sharing policy innovations globally.	Engage with global GenAI initiatives, support capacity-building in underserved institutions, and collaborate on AI research centers tackling pressing worldwide issues.

Source: self-developed based on [11]

Stage 1. Developing adaptive management strategies and strategic planning for integrating generative AI into the educational process

Focus areas:

- Harnessing the potential of generative AI (GenAI) to shape flexible and adaptive university management strategies.

- Integration of digital and AI technologies into strategic planning, educational policy, and research processes.
- Supporting China's national initiatives to digitalize education and introduce AI into higher education institutions.

Political measures:

- Establishing AI governance bodies: Forming university committees and working groups with faculty, researchers, IT specialists, students, and industry representatives.
- Implementation of multi-sector decision-making models: Actively engaging various departments (academic, administrative, IT, and international cooperation) to jointly develop and implement AI policies.
- Alignment with national and regional standards: integrating university strategies with the initiatives of the Chinese Ministry of Education and digital transformation programs (“Digital Campus” and “Smart Education”).

Examples of interventions:

- Regular evaluation and review of AI policies: conducting an annual audit of the implementation of AI technologies, assessing their effectiveness and compliance with educational standards.
- Developing partnerships and collaborative learning networks: Collaborating with leading Chinese universities (e.g., Tsinghua, Peking University) and international universities and organizations (e.g., UNESCO AI initiatives) to share experiences and best practices.
- Organizing internal forums and workshops on AI: sharing experiences between faculties, stimulating discussions on the implementation of GenAI in educational and research processes.
- Creating a digital platform for monitoring and coordinating AI implementation: a centralized system for tracking AI initiatives, analyzing their impact on educational outcomes, and ensuring transparency in decision-making.

Stage 2. Ensuring equal access to AI technologies, promoting inclusivity, and reducing the digital divide among all student categories

Focus areas:

- Promoting inclusive AI tools that take into account the cultural and linguistic diversity of students.
- Ensuring equal access to educational resources, including for students from remote regions and socially vulnerable groups.
- Reducing the digital divide and increasing the participation of all categories of students in innovative educational initiatives.

Political measures:

- Developing inclusive AI policies: Developing strategies to ensure AI tools are accessible to all students and faculty.
- Investing in bridging the digital divide: Providing hardware, software, and reliable internet access to remote campuses and low-income students.
- Cultural and linguistic sensitivity: adapting AI systems to local languages and cultural contexts to ensure learning is understandable and accessible to all.

Examples of interventions:

- Multilingual AI tools: development of educational platforms in Mandarin, Cantonese, and English, support for subtitles, voice input, and content translation.
- Specialized learning programs for low-income and remote student populations, including AI-enabled online courses and mentoring.
- Ensuring inclusive design of educational materials: Using AI to create adaptive learning modules tailored to individual student needs.
- Partnerships with local communities and schools: joint projects to expand access to digital educational resources and develop AI skills among young people.
- Monitoring and evaluating equal access: collecting and analyzing data on the use of AI tools by different categories of students to promptly remove barriers.

Stage 3: Ensuring the ethical, safe, and fair use of generative AI through risk management and regulatory implementation

Focus areas:

- Ensuring the safe, fair, and ethical use of AI in education and research.
- Minimizing the risks of bias, privacy violations, and errors in AI systems.
- Alignment of AI implementation with national laws, regulations, and standards of the Ministry of Education of China.

Political measures:

- Ethics education and training: Incorporate modules on AI ethics, accountability for results, and critical analysis of algorithms into faculty and student training programs.
- Developing transparency and bias prevention protocols: Mandatory recording of AI use in educational materials and research, and regular testing of algorithms for errors or discriminatory patterns.
- Establishing AI governance bodies and external audits: Forming university AI oversight committees and conducting periodic independent assessments of the systems.

Examples of interventions:

- Formation of the university's AI council: participation of faculty, researchers, IT specialists, and students to oversee ethical aspects.
- Regular external audits of AI systems: checking algorithms for security, fairness, and compliance with educational standards.
- Implementation of AI ethics training programs: seminars, online courses, and workshops for educators and researchers.
- Monitoring transparency and accountability: Using digital platforms to document the role of AI in educational materials and scientific publications.
- Developing incident response procedures: a plan of action when errors, bias, or data breaches are detected.

Stage 4: Creation of modern digital and physical infrastructure, investments in AI technologies, and support for interdisciplinary research

Focus areas:

- Creating a reliable and secure infrastructure for the implementation of AI in education and research.
- Providing financial support for modern AI technologies and interdisciplinary research projects.
- Forming a long-term digital transformation strategy in line with China's national initiatives such as "Digital Campus" and "Smart Education".

Political measures:

- Investing in cutting-edge AI technologies: acquiring modern hardware, software, and cloud solutions to support generative AI.
- Developing specialized AI infrastructure: creating laboratories, research centers, and platforms for collaborative work between faculty and students.
- Funding for interdisciplinary research projects: supporting initiatives that bring together different faculties and fields of study to address global challenges (e.g. sustainable development, healthcare, smart cities).
- Ensuring cybersecurity and system reliability: implementing data protection protocols, backups, and security monitoring for AI platforms.

Examples of interventions:

- Establishment of university AI centres with laboratories for training, experimentation, and research.
- Deployment of cloud platforms and digital data repositories that provide secure storage and shared access to educational and research resources.
- Financing of joint projects between faculties, departments and international partners.
- IT infrastructure upgrade: modernization of servers, networks, and computer rooms to support AI applications.

- Implementation of monitoring and reporting systems for resource use and the effectiveness of AI technology implementation.

Stage 5. Developing AI literacy and professional skills of teachers, researchers, and students for the effective use of AI

Focus areas:

- To develop skills in teachers, researchers, and students to work with generative AI (GenAI) and other AI technologies.
- Providing continuous professional development and advanced training in the field of AI.
- Creating an interdisciplinary environment where AI literacy becomes a key component of the educational and research process.

Political measures:

- Developing targeted educational programs: training teachers, researchers, and students in AI skills, including applications in teaching, research, and management.
- Promoting interdisciplinary AI literacy: integrating AI modules into various educational programs and supporting joint projects between faculties.
- Focus on ethics and reproducibility: Include topics on data ethics, the appropriate use of AI, and adherence to research reproducibility standards in training programs.

Examples of interventions:

- AI literacy workshops for educators and researchers, including hands-on sessions with generative AI.
- Peer learning programs for students: student mentoring, collaborative projects, and AI hackathons.
- Specialized training for research projects: courses and workshops on data ethics, the correct use of AI, and reproducibility methods.
- Creating online platforms for continuous learning and knowledge sharing on AI between faculties.

- Assessing the effectiveness of training through monitoring acquired skills and implementing feedback to improve programs.

Stage 6. Integrating intelligent AI tools into teaching, learning, and assessment, providing personalized trajectories and adaptive feedback

Focus areas:

- Integrating intelligent AI tools to improve the accuracy and reliability of learning outcomes assessment.
- Implementing personalized educational trajectories using the capabilities of generative AI.
- Improving the quality of student feedback through adaptive AI systems in both formative and summative assessment.

Political measures:

- Developing AI-enhanced curricula: Creating courses and modules that integrate generative AI, accompanied by transparent guidelines for the use of AI in assessment.
- Testing personalized learning environments: piloting adaptive AI platforms that adapt to each student's level of knowledge and learning style.
- Improving the transparency and reliability of assessment: Using AI to automatically grade assignments, analyze progress, and generate personalized feedback.

Examples of interventions:

- Pilot adaptive learning platforms powered by generative AI that provide students with personalized assignments and recommendations.
- AI-assisted feedback: automatically provides comments on assignments, identifies weaknesses, and suggests additional learning resources.
- Training teachers to use AI tools to correctly use GenAI in assessing and monitoring student progress.
- Performance Monitoring and Data Analysis: Using AI to identify patterns, problem areas, and the effectiveness of educational programs.

- Creating guidelines and protocols for the responsible and transparent use of GenAI in educational processes.

Stage 7: Fostering AI-enabled research and knowledge generation, ensuring transparency, reproducibility, and interdisciplinary collaboration

Focus areas:

- Advancing research supported by generative AI with a focus on reproducibility, ethical responsibility, and bias prevention.
- Creating an environment for interdisciplinary work where AI technologies serve as a tool for new discoveries and innovations.
- Ensuring transparency in research publications and reporting on the role of AI.

Political measures:

- Supporting researchers with AI technologies: providing access to generative AI platforms and tools for data analysis, modeling, and knowledge generation.
- Ensuring research transparency and reproducibility: implementing requirements to record AI participation in publications and to adhere to reproducibility standards.
- Promoting interdisciplinary approaches: stimulating joint projects between faculties, departments and international partners to solve complex scientific problems.

Examples of interventions:

- AI-enhanced Research Investments: Funding projects using generative AI for science and innovation.
- Deploying AI platforms for knowledge sharing: creating digital repositories, collaborative workspaces, and databases for research groups.
- Transparently document the role of AI in publications: Mandatory disclosure of the use of AI tools in articles, reports, and projects.

- Educating researchers on data ethics and bias prevention: seminars and workshops on the responsible use of AI in research.
- Stimulating international collaboration: joint research initiatives with global universities and research centers to address challenges in sustainable development, health and technology.

Stage 8. Development of international cooperation and exchange of best practices, creation of global platforms for joint research and educational initiatives

Focus areas:

- Promoting international collaboration to share resources, exchange knowledge, and implement best practices in generative AI.
- Supporting academic and research partnerships that foster the development of competencies and improve the quality of educational and research processes.
- Ensuring the participation of universities in global AI initiatives, such as UNESCO projects and other international networks.

Political measures:

- Developing platforms for international dialogue and mentoring: creating online and offline platforms for knowledge sharing, webinars, and coordinating joint projects.
- Sharing innovations in policy and educational practices: implementing global best practices in AI governance, training, and research projects.
- Promoting capacity development for under-resourced universities: mentoring, technical support and collaborative research initiatives.

Examples of interventions:

- Participation in global GenAI networks: connecting to international initiatives, sharing educational and research resources.
- Joint research centres: developing international projects aimed at solving global problems such as sustainable development, healthcare and future technologies.

- Mentoring and exchange programs: supporting universities with limited resources through joint projects, internships, and consulting.
- Webinars and conferences with international experts: Regular meetings to share best practices in AI and generative AI.
- Collaborative knowledge management platforms: digital repositories, databases, and collaboration systems for international research and educational initiatives.

The stages of AI integration into the educational processes of higher education institutions are presented in Table 3.2.

Table 3.2.

Stages of AI integration into educational processes of higher education institutions

Stage	**Actions**	**Responsible**
1. Development of adaptive management strategies and strategic planning	Establishment of the University's AI Council; development of strategic plans; implementation of a digital platform for monitoring initiatives	Rector, vice-rectors, IT director, faculty representatives, student council
2. Ensuring equal access and inclusiveness	Digital divide analysis; equipment procurement; implementation of multilingual platforms; mentoring programs	Vice-Rector for Academic Affairs, IT Department, Inclusion Department
3. Ensuring the ethical, safe, and fair use of AI	Establish AI ethics committees; conduct workshops; develop transparency protocols; conduct external audits	Legal Department, AI Council, Research and Quality Department
4. Creating modern infrastructure and investing in AI	Construction of AI centers; modernization of IT networks; procurement of equipment and software; implementation of cloud platforms	IT Director, Vice-Rector for Research, Finance Department
5. Development of AI literacy and professional skills	Workshops and online courses; peer learning programs; interdisciplinary projects	Vice-Rector for Academic Affairs, Department of Advanced Training, teachers
6. Integrating AI into Teaching, Learning, and Assessment	AI pilot platforms; teacher training; implementation of adaptive learning environments; transparent feedback	Deans of faculties, teachers, IT department

7. Stimulating AI-enabled research and knowledge generation	Access to AI tools; creation of interdisciplinary research centers; transparent recording of the role of AI in publications	Vice-Rector for Research, Research Groups, Library
8. Development of international cooperation and exchange of best practices	Participation in global initiatives; creation of joint research projects; mentoring for universities with limited resources	Vice-Rector for International Affairs, Department of External Relations, AI Council

Source: self-developed

Effective implementation of GenAI at a university requires strategic planning and rational resource allocation, taking into account the institutional context and key needs. Supporting AI-based teaching and research requires attention to computing infrastructure, software, data, human resources, and network capabilities, with clear priorities and financially sustainable strategies.

A key element of successful GenAI implementation is an efficient computing infrastructure. For most educational institutions, the most cost-effective and scalable solution is cloud services, including local Chinese platforms such as Alibaba Cloud, Tencent Cloud, and Huawei Cloud, which provide GPUs and TPUs on-demand, as well as managed services that reduce the burden on IT departments. Local high-performance clusters may be necessary only for large research projects, while for basic educational use they are often overkill. As a budget-friendly strategy, it is recommended to use free, open-source tools and frameworks—Python, TensorFlow, PyTorch, Hugging Face Transformers, and scikit-learn—as well as development environments such as Google Colab and Jupyter Notebook, adapted to local requirements. Specialized commercial solutions, such as those for generative design, can be used selectively, but their cost should be carefully weighed against the educational and research benefits, with preference given to open and accessible alternatives.

Another critical resource for GenAI implementation is data. Institutions are encouraged to utilize open educational resources (OERs) and publicly available datasets whenever possible, although working with institutional data requires strict adherence to privacy and ethical principles. Investments in data collection, storage,

and management should not be underestimated, as they often represent significant hidden costs. A reliable network infrastructure with high-speed internet access and sufficient bandwidth is necessary to operate cloud services and transfer data for AI applications. Specialized labs and physical spaces can be helpful, but human resources remain a key component: faculty experience and training are a top priority. Successful AI projects also require qualified technical staff, which can be trained internally or recruited externally, and curriculum developers with AI integration skills significantly improve the effectiveness of the educational process. The key resource and infrastructure needs for GenAI are presented in Table 3.3.

Table 3.3

Key resource and infrastructure needs for GenAI

Key resource and infrastructure for GenAI	Key consideration	Details and requirements
Computing resource	High performance	Investments in high-performance computing (HPC) infrastructure, including GPUs and cloud platforms such as Alibaba Cloud, Tencent Cloud, and Huawei Cloud, are key to training and developing GenAI models at Chinese universities. Institutions are encouraged to leverage open resources, local cloud services, and grant funding opportunities to optimize costs and expand computing capacity for educational and research purposes.
Artificial Intelligence-based tools and software	Availability	Chinese universities recommend providing students and faculty with access to programming libraries such as TensorFlow and PyTorch, as well as development environments including Jupyter Notebook and local Google Colab alternatives. For solving a variety of AI tasks—from text and image processing to code generation—user-friendly platforms should be used, taking into account open-source capabilities, educational licenses, and cloud services such as Alibaba Cloud, Tencent Cloud, and Huawei Cloud.
Access to data	High-quality datasets	Investment is needed in the creation and maintenance of interdisciplinary data repositories, leveraging open datasets, partner resources, and data enrichment methods to address limitations. It is also crucial to ensure infrastructure and resources are accessible to all students, including those with special educational needs, by providing assistive technology and adaptive learning environments.

Network connection	Reliability and high speed	Reliable and high-speed network connectivity is essential to ensure students and faculty can effectively use cloud resources, collaborative projects, and AI-powered online tools.
Technical support	Timely assistance	Help desks, online forums, and training resources should be created to provide technical assistance in using AI software, troubleshooting, and accessing computing resources.
Budget planning	Resource allocation	Resources need to be allocated for hardware, software, data collection, technical support, and faculty training, with grant funding, industry partnerships, and cost-effective solutions, including cloud computing, considered.

Source: Source: self-developed based on [31]

The integration of GenAI into higher education is not a thing of the future, but a pressing need. Universities must embrace innovations in curricula, new pedagogical models, and modern assessment systems today, while simultaneously developing faculty and establishing strategic partnerships with industry and research organizations. Adherence to ethical standards and accountability at all stages of AI implementation remain key. A focus on faculty-student interaction, continuous learning, and adaptation will unlock GenAI's potential, creating effective, engaging, and equitable learning environments to successfully prepare students for a rapidly changing world.

Thus, the implementation of generative AI in higher education creates the conditions for significantly improving future educational outcomes. AI tools will allow the university not only to more accurately assess academic achievement and track student progress in real time, but also to predict their educational trajectories, identifying potential knowledge gaps in advance. This will ultimately ensure personalized learning, higher levels of academic performance and student engagement, and the continuous improvement of digital educational programs. Ultimately, the integration of GenAI creates a dynamic and adaptive education system capable of effectively responding to changing labor market demands and educational standards, creating sustainable long-term outcomes for students and the university.

3.2. Strategies to Enhance Teaching Effectiveness, Student Engagement, and Personalized Learning

Effective educational management strategies create a dynamic and inspiring learning environment, fostering the innovative thinking and problem-solving skills needed for students' future success. A central role is played by the development of relevant curricula focused on critical, creative, and practical learning through problem-based projects, independent research, and simulated real-world situations. Furthermore, the implementation of project-based learning, internships, collaborative industry initiatives, and extracurricular activities provides students with the opportunity to apply their knowledge in practice, developing key competencies in a realistic environment.

Educational management plays a key role in engaging students in educational decision-making, providing them with opportunities to participate in program development, research topic selection, and outcome assessment, which fosters a sense of responsibility and stimulates intrinsic motivation. At the same time, creating an inclusive and collaborative learning environment that encourages collaboration and the exchange of ideas between students from diverse backgrounds fosters creativity, innovative thinking, and reduces educational inequality.

Effective educational management provides teachers with the necessary support, resources, and training in innovative methods, which helps develop students' creative thinking and problem-solving skills. Creating a stimulating and motivating learning environment is achieved through the strategic allocation of resources, the development of organizational culture and leadership, and the ongoing collection of feedback from students, faculty, and other stakeholders. This approach, based on empirical data and theoretical management concepts, allows strategies to be tailored to the real needs of the educational community and helps students develop the competencies necessary for successful development in the era of globalization.

From the perspective of educational management theories, transformational leadership and collaborative leadership strategies play a key role in creating an

innovative environment. Transformational leadership fosters a vision for change, motivates faculty and students to embrace new approaches and develop creative and critical thinking, and provides the necessary resources and support for experimenting with teaching methods. Applying systems theory allows for a holistic approach to the educational process, aligning curricula, teaching methods, and student engagement to foster a comprehensive environment that fosters innovation and collaborative projects. Strategies to Enhance Teaching Effectiveness, Student Engagement, and Personalized Learning are presented in Figure 3.1.

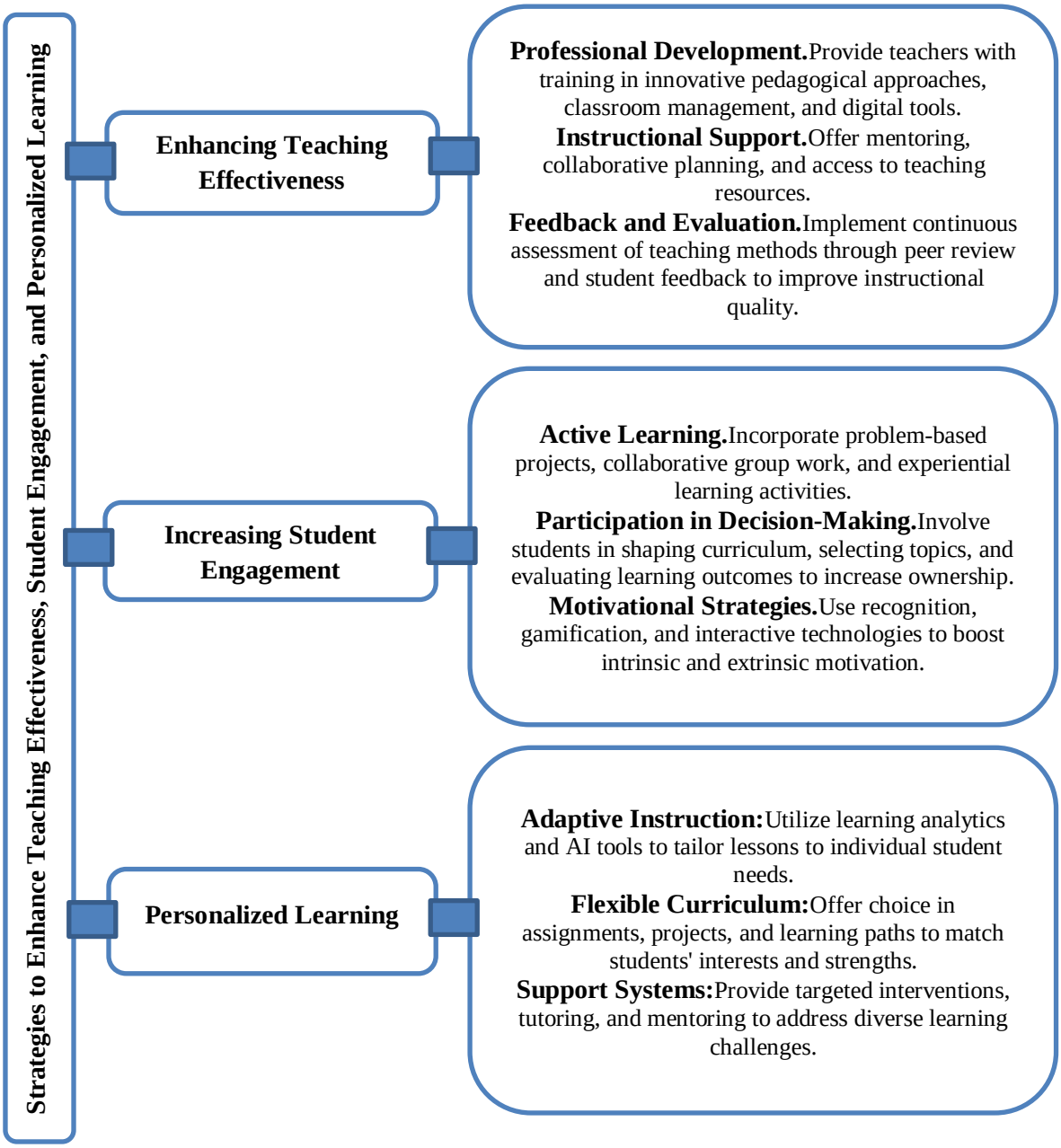

Fig. 3.1. Strategies to Enhance Teaching Effectiveness, Student Engagement, and Personalized Learning

Source: self-developed

Therefore, universities should implement strategies to improve teaching effectiveness, student engagement, and personalized learning, creating a learning environment that fosters critical thinking, creativity, and independence.

1. To improve teaching effectiveness, it is recommended to train teachers in innovative methods, provide mentoring, access to resources, and regular feedback to improve the quality of teaching.

2. To increase student engagement, it is recommended to implement active learning methods, involve students in decision-making, and use motivational strategies to increase participation and responsibility.

3. To implement personalized learning, it is recommended to use adaptive approaches, flexible programs and support systems, including mentoring and individual consultations, to take into account the needs of each student and develop key competencies.

It is necessary to provide teachers with resources and support, involve students in learning planning and assessment processes, and tailor curricula to individual needs in order to prepare students for professional and personal success.

3.3. Systems for Assessing Learning Outcomes, Tracking Progress, and Continuously Improving Digital Learning Initiatives

The integration of generative artificial intelligence (GenAI) into the educational process opens up new opportunities for assessing learning outcomes, tracking student progress, and continuously improving digital educational initiatives. GenAI enables the creation of adaptive feedback systems, personalized learning paths, and interactive learning materials that are tailored to the needs of each student. With the rapid adoption of online and hybrid learning formats, leveraging GenAI's capabilities is becoming critical for enhancing the effectiveness of pedagogical approaches, improving academic performance, and optimizing digital platforms. Thus, the implementation of generative AI contributes to the strategic development of the educational environment, enhancing the quality of education, and building a university's competitive advantage globally.

Moving beyond passive information acquisition, active learning engages students in hands-on activities, stimulating critical thinking and creative problem-solving. Generative AI offers effective strategies for enhancing teaching quality, deepening student engagement, and creating personalized educational trajectories. AI technologies can model knowledge structures, predict learning outcomes, and apply rules for analyzing scientific research. Students are given the opportunity to thoroughly explore AI, evaluate its results, and formulate their own reasoned conclusions, enhancing active participation in learning and promoting the individualized development of each student.

Problem-based learning (PBL), which focuses on students and solving complex problems, can be significantly enhanced by generative AI. GenAI enables the creation of realistic and engaging scenarios tailored to learning objectives, such as modeling business or engineering processes. AI tools help gather and synthesize information, accelerating research and allowing students to focus on critically analyzing and evaluating proposed solutions. It is also important to prepare students to validate sources, identify biases, and critically evaluate AI results. AI can be used to explore structural designs, simulate performance, and test hypotheses, after which students evaluate and justify their final choices based on engineering principles or academic standards. Thus, generative AI enhances active learning, fosters creativity, critical thinking, and a personalized approach to educational tasks, while supporting instructors in providing feedback and final assessment.

Project-based learning (PjBL), which engages students in complex projects to solve real-world problems, can be significantly expanded with generative AI. AI technologies enable the creation of initial content drafts, data analysis and visualization, and accelerated prototyping and design exploration, while students retain responsibility for evaluating, refining, and making original contributions. GenAI also supports personalized learning, offering tailored approaches tailored to students' interests and goals. For example, in marketing projects, AI can generate various campaign concepts that students analyze, adapt, and integrate into their own solutions.

Generative AI offers significant potential for simplifying and enriching interdisciplinary learning. It helps overcome communication barriers, translate technical jargon, synthesize disparate data, and create visualizations to understand complex relationships. Furthermore, GenAI supports collaborative projects by providing digital workspaces for brainstorming, idea generation, and the creation of integrated content such as reports or presentations. It also effectively analyzes interdisciplinary data, identifying patterns and connections across different fields of knowledge, fostering deeper understanding and collaboration across disciplines.

The integration of generative artificial intelligence (GenAI) into the educational process opens up new opportunities to improve the quality of learning and expand teaching practices. GenAI enables more effective, dynamic, and student-centered learning, opening up opportunities for interdisciplinary and project-based approaches. The pedagogical benefits of integrating generative artificial intelligence into the educational process are presented in Figure 3.2.

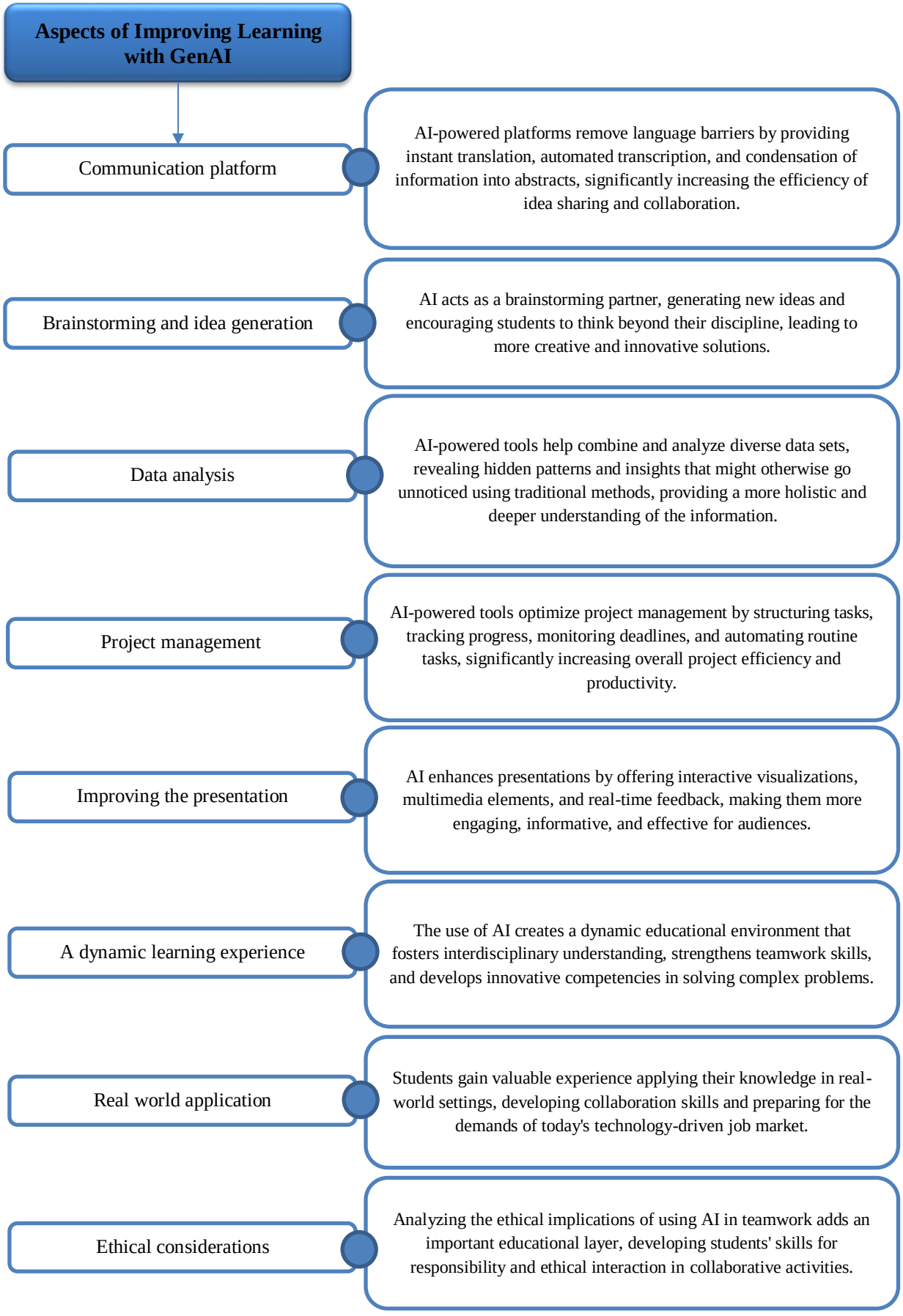

Fig. 3.2. Aspects of improving learning using GenAI

Source: self-developed

To successfully integrate AI tools into the educational process, it is recommended that they be developed with a human-centered approach, taking into account the needs, preferences, and learning styles of students, providing multimodal content, transparent algorithms, and inclusive approaches, as well as proactively addressing ethical issues, including protecting student privacy and rights. It is important to conduct robust experiments and pilot projects to evaluate the impact of AI across various disciplines and on short- and long-term learning outcomes, as well as to create assessment systems that facilitate the continuous improvement of tools. Ethical and legal regulation should include identifying and eliminating algorithmic biases, ensuring the transparency and accountability of AI, protecting student rights, and paying close attention to the environmental impacts of technology implementation. AI should be viewed as a supporting tool that complements, but does not replace, pedagogical decisions; educators retain autonomy while using AI to support critical thinking, individual student development, and enhance digital literacy. Finally, it is important to foster critical thinking skills in students, develop faculty capacity to evaluate and integrate AI into teaching, and implement existing AI literacy frameworks to ensure informed, responsible, and effective use of technology in higher education.

Conclusion to section 3

To enhance the quality of digital learning in Chinese universities, it is recommended to integrate generative AI (GenAI) into learning management systems (LMS). GenAI will enable the creation of personalized learning paths, accelerate the delivery of feedback, and improve the accuracy of assessments. GenAI is capable of analyzing vast amounts of data on student progress, identifying learning gaps, and suggesting optimal development paths. The implementation of AI in LMSs not only increases student engagement and motivation but also supports faculty in making pedagogically sound decisions, creating a more interactive, adaptive, and effective learning environment. To effectively integrate generative AI (GenAI) into higher

education, a set of strategies aimed at modernizing the teaching and research process is proposed.

Effective implementation of GenAI at a university requires strategic planning and rational resource allocation, taking into account the institutional context and key needs. Supporting AI-based teaching and research requires attention to computing infrastructure, software, data, human resources, and network capabilities, with clear priorities and financially sustainable strategies. It is recommended to implement strategies that enhance teaching effectiveness, foster student engagement, and support personalized learning, thereby creating a learning environment that encourages critical thinking, creativity, and independence.

The integration of generative artificial intelligence (GenAI) into the educational process opens up new opportunities for assessing learning outcomes, tracking student progress, and continuously improving digital educational initiatives. Thus, the implementation of generative AI will facilitate the strategic development of the educational environment, enhance the quality of education, and build the university's competitive advantage globally.

CONCLUSSIONS

Based on the research on digital technologies in managing the learning process of students in universities of the People's Republic of China, the following conclusions were drawn:

1. Analysing the theoretical foundations of digital technologies in managing student learning in Chinese universities highlights their key role in modernizing and enhancing higher education. Educational management functions as an integrated system encompassing planning, organization, motivation, monitoring, and continuous improvement of teaching and learning processes. In the era of AI, digital transformation enables more flexible, holistic, and personalized approaches, integrating online courses, learning management systems, AI-driven platforms, and immersive technologies. China's model combines global digital trends with national educational priorities, creating a unique trajectory that reflects both innovation and socio-cultural context.

2. Analysing the use of digital technologies in managing university education in China reveals specific approaches and tools that enhance the efficiency and quality of learning within the national education system. Digital learning technologies transform traditional education into a more interactive, engaging, and personalized experience, expanding access to knowledge, promoting active participation, and supporting deeper comprehension and retention. Chinese universities employ a variety of tools to optimize teaching and learning, including learning management systems (LMS), personalized learning platforms (LXP), content creation tools, assessment systems, learning analytics, and big data solutions. Collaboration tools, AI-driven tutoring, immersive VR/AR/MR technologies, mobile apps, and gamified learning environments further enhance engagement and motivation. This integrated ecosystem reflects a strategic approach to digital transformation, aligning educational practices with global trends while addressing China's socio-educational priorities.

3. Examining the theoretical perspectives of Chinese scholars on the integration of digital technologies in student learning management reveals key

conceptual approaches and directions for the development of digital educational management. It is evident that leveraging the innovative potential of digital technologies enhances flexibility, interactivity, and personalization in learning. Integrating digital solutions into university management systems and developing coordinated intelligent learning management systems improves data utilization, resource allocation, and communication across all levels, increasing transparency and reducing feedback time. Digital technologies enable a more personalized and accessible learning process that accommodates diverse learning styles and student needs. Tools such as artificial intelligence, learning analytics, and gamified learning platforms support effective collaborative learning strategies, enhance engagement, and foster motivation, ultimately improving the quality and effectiveness of the educational process.

4. An assessment of the current state of digital learning in Chinese universities revealed effective practices in the implementation of learning management systems and digital platforms. This study examined the application of digital technologies at five leading universities in China: Tsinghua University (Beijing), Peking University (Beijing), Zhejiang University (Zhejiang), Shanghai Jiao Tong University (Shanghai), and Fudan University (Shanghai). It was found that these universities are implementing innovative educational technologies in a comprehensive manner. Together, these technologies create a modern educational ecosystem where learning is interactive, personalized, and practice-oriented, enhancing the effectiveness of higher education and preparing students to meet the challenges of a rapidly changing world.

5. By identifying obstacles, technological limitations, and potential directions for improving the implementation of digital technologies in managing the learning process, key challenges and opportunities for their resolution were determined. To identify barriers and opportunities for integrating digital tools into education, an online survey was conducted with 37 instructors from five leading universities in China. The results indicated that the main barriers to implementing digital technologies included the lack of a systematic approach and strategic planning, a

deficit of digital competencies and qualified personnel, uneven levels of digital literacy among faculty, institutional unpreparedness, and bureaucratic hurdles. Other issues noted were organizational inflexibility, weak interdepartmental collaboration, increased administrative workload, technostress, conflicts between technology and cultural values, and financial constraints. Based on the survey results, the main directions for improving educational processes with the use of digital technologies were identified. Priorities include aligning university digital transformation strategies with national directives, raising educational standards, and upgrading infrastructure, including networks, VR/AR laboratories, and server equipment. Developing collaboration with businesses, forming hybrid teams, and implementing generative AI and data analytics tools were also highlighted as important. In addition, instructors emphasized the need to integrate systems and create a unified digital ecosystem, enhance digital and AI literacy among all participants in the educational process, improve technical support and cybersecurity, and adapt content to local conditions.

6. By developing a comprehensive strategy to enhance the effectiveness of learning management systems, methods were proposed for integrating digital platforms, improving teaching quality, increasing student engagement, and refining systems for assessing learning outcomes. Accordingly, to improve the quality of digital learning in Chinese universities, the integration of generative AI (GenAI) into learning management systems (LMS) is recommended. GenAI enables the creation of personalized learning pathways, accelerates the provision of feedback, and enhances the accuracy of knowledge assessment. It can analyze large volumes of student progress data, identify learning gaps, and suggest optimal development trajectories. Implementing AI within LMS not only boosts student engagement and motivation but also supports instructors in making pedagogically informed decisions, fostering a more interactive, adaptive, and effective learning environment.

To effectively integrate generative AI (GenAI) into higher education, a set of strategies is proposed to modernize the teaching and research process.The stages of

integrating AI into the educational processes of higher education institutions include:

1. Developing adaptive management and strategic planning strategies
2. Ensuring equal access and inclusiveness
3. Ensuring the ethical, safe, and fair use of AI
4. Building modern infrastructure and investing in AI
5. Developing AI literacy and professional skills
6. Integrating AI into teaching, learning, and assessment
7. Stimulating AI-enabled research and knowledge generation
8. Developing international collaboration and sharing best practices

Effective implementation of GenAI in a university requires strategic planning and rational allocation of resources, taking into account the institutional context and key needs. Supporting AI-based learning and research necessitates attention to computational infrastructure, software, data, human resources, and network capabilities, guided by clear priorities and financially sustainable strategies. It is recommended to implement strategies aimed at enhancing teaching effectiveness, student engagement, and personalized learning, thereby creating an educational environment that fosters critical thinking, creativity, and autonomy. The integration of generative artificial intelligence (GenAI) into the educational process opens new opportunities for assessing learning outcomes, tracking student progress, and continuously improving digital learning initiatives. Thus, the implementation of GenAI will contribute to the strategic development of the educational environment, the improvement of learning quality, and the establishment of competitive advantages for the university on a global scale.

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APPENDICIES

Appendix A

List of Chinese Online Course Platforms (MOOCs) in 2025

XuetangX

In 2013, Tsinghua University launched XuetangX, China's first MOOC platform, offering 10,000+ courses. By 2021, it had 80M users. After Series B funding and a 2020 website redesign, it went global with 470 free English courses.

Chinese University MOOC

Chinese University MOOC, or iCourse, is a collaboration between NetEase and the original iCourse platform. It offers 10,000+ free and paid courses from 800+ universities, including nationally recognized MOOCs, with free digital certificates awarded for passing quizzes and finals.

Zhihui Shu

Zhihui Shu ("Wisdom Tree") launched in December 2012, enabling universities to share credit-bearing courses and support academic credit mobility across China. Of its 14,100 courses, 10,500 (75%) are for on-campus credit. The platform also offers 45 courses with free digital certificates and 30 micro-credential programs.

CNMOOC

In April 2014, Shanghai Jiao Tong University launched CNMOOC, a platform integrating MOOCs into China's higher education. It offers 3,000+ courses, with about half providing free digital certificates.

Xue Yin Online

Xue Yin Online, launched in November 2017 by The Open University of China and Chaoxing Group, serves as a "credit bank" for vocational skills, supporting credit transfer and recognition of prior learning. It offers around 16,000 courses with free digital certificates.

Chinese MOOCs

Chinese MOOCs, founded in February 2015 by Peking University and Alibaba Group, offers around 150 free courses, mostly from Peking University.

UOOC Online

The University Open Online Courses (UOOC) platform, founded by Shenzhen University in February 2016, merged a 2014 MOOC platform. It offers 1,500+ free courses, most granting credit to on-campus students.

Zhejiang Provincial MOOC Platform

The Zhejiang Provincial MOOC Platform, supported by Zhejiang's Education Department, offers 17,500 courses.

E-Huixue

In December 2015, Aihui District's Department of Education launched E-Huixue, a regional online course repository offering 2,500+ MOOCs with free digital certificates.

CQOOC

The Chongqing University Open Online Learning Platform (CQOOC), established by Chongqing's Ministry of Education in June 2016, offers around 4,300 courses, mainly from local universities and colleges.

Rong You Xue Tang

Rong You Xue Tang, formerly the Beijing MOOC Research Association platform, was founded in 2016 by Renmin University and other Beijing universities. It offers 210+ free courses, some eligible for academic credit.

Ulearning

Ulearning, launched in May 2015, offers nearly 2,700 courses.

ICVE MOOC College

ICVE, launched by Higher Education Press in 2014 for professional education, offers 7,300+ free courses, with over 80% providing free certificates.

ICC

ICC, launched by Higher Education Press in 2016, offers 4,500+ courses from 210 universities.

PMPHMOOC

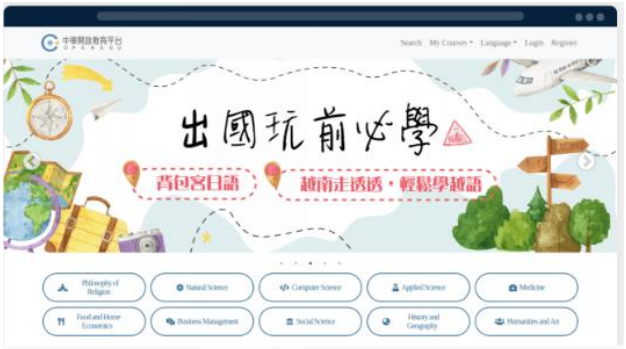
PMPHMOOC, established in 2015 by People's Medical Publishing House with Chinese medical schools and universities, offers 70 health-related MOOCs across 10 subjects, including anatomy and biochemistry.

UMOOCs

UMOOCs, founded in December 2017 by Beijing Foreign Studies University and affiliated with the Foreign Language Teaching and Research Press, offers 500+ free courses with certificates across 10 languages.

eWant

eWant, launched in 2013 by National Chiao Tung University in Hsinchu, Taiwan, hosts 4,000+ courses from over 90 universities.



ShareCourse

ShareCourse, founded in September 2012 by Taiwan's National Tsing Hua University, offers 650+ courses from 90 institutions, with around 190 available for free.

OpenEdu

OpenEdu, a Taiwan-based MOOC platform built on Open edX, offers 480+ courses in computer science, business, humanities, and arts.

Educoder

Educoder, launched in July 2016, is a computer science and programming MOOC platform offering 640+ free courses and thousands of programming exercises. Verified users can create their own courses, exercises, and online classrooms.

iLab-X

iLab-X, launched by Higher Education Press in 2017, is a MOOC platform for virtual simulation experiments, offering nearly 5,000 experiments.

Gaoxiaobang

Gaoxiaobang, launched in September 2015 by a Huike Group subsidiary, offers around 500 free courses focused on upskilling and reskilling in tech-related fields.

Sourse: Ma, R., Mendez, M.C., & Bowden, P. (2025). Massive List of Chinese Online Course Platforms in 2025. https://www.classcentral.com/report/chinese-mooc-platforms/

Appendix B

China Learning Management System Market

Alibaba Cloud
Cloud infrastructure, high scalability, integration with corporate and educational systems.

Hujiang
Personalized online courses with a focus on language learning and professional development, tailored to the Chinese audience.

Tencent
Built-in communication tools (WeChat, QQ) for distance learning, gamification and multimedia content.

Squirrel AI
Uses artificial intelligence for adaptive learning, adjusting content to the learner's level and pace.

New Oriental Education
A combination of online and offline formats, focusing on exam preparation and professional courses.

Yuanfudao
A mobile LMS focused on online tutoring, video lessons, and personalized learning programs.

TAL Education Group
A multi-level LMS platform for schoolchildren and students, integrated with performance analytics and gamification.

iCourse (中国大学MOOC)
A national platform for universities, integration with university LMSs, and support for massive open online courses.

Wisdom Education
Online schools and general education platforms, with an emphasis on individualized learning paths and digital progress monitoring.

DingTalk (Alibaba Group)
A combination of communication, learning management, and analytics tools; widely used in companies and universities.

Cloud Academy
A cloud-based LMS for corporate and university education, including virtual labs and analytics dashboards.

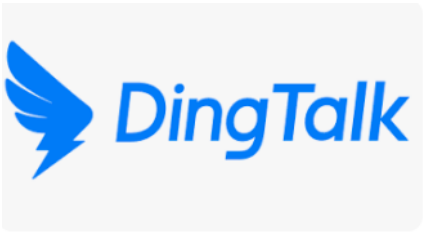
NetEase
A wide selection of online courses, LMS with the ability to integrate interactive materials and streaming video.

Baidu
Uses AI and big data to personalize learning, search and analytics integration into LMS.

Source: Dhapte, A. (2025)

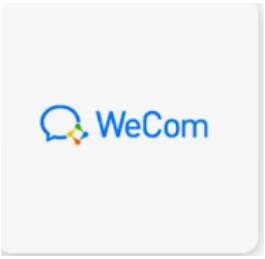
. Appendix C

Key Chinese Teamwork Platforms



DingTalk (钉钉)

Developed by Alibaba Group, this tool combines chat, video conferencing, task management, and document management.



WeCom (企业微信)

A Tencent app integrated with WeChat. Designed for corporate communications, it supports messaging, video calls, and task management.

Feishu (飞书)

Developed by ByteDance, this tool combines chat, video conferencing, calendars, and document collaboration.

Lark (飞书)

ByteDance's solution, aimed at the international market, offers collaboration features including chat, video calls, and project management.

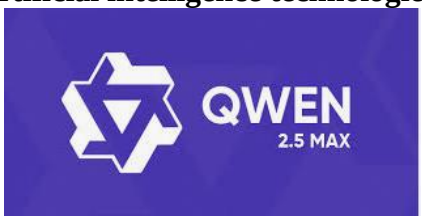
Huawei Cloud WeLink (华为云WeLink)

Huawei's platform offers enterprise communications and collaboration solutions, including video conferencing, messaging, and task management.

Artificial intelligence technologies

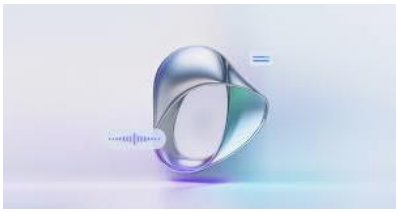
DeepSeek-V3.2-Exp

A sparse attention model optimized for Chinese chips (Ascend, Cambricon) and large text arrays; provides high processing speed and memory savings



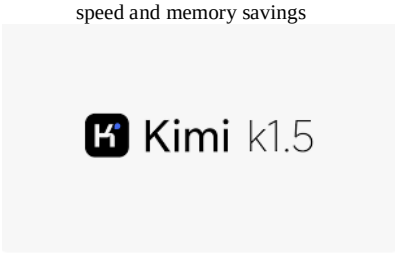
Qwen 2.5-Max

A general-purpose NLP and code generation model, openly available to researchers, featuring consistent accuracy and scalability.



Doubao 1.5 Pro

A high-performance model for text generation and data analysis; effective for teaching and research tasks, easily integrated into educational platforms



Kimi K1.5

The model is capable of processing up to 200,000 Chinese characters per query; it provides high accuracy when working with large text corpora.

GLM-4 Plus (ChatGLM)

An open, flexible model for NLP and text generation, compatible with various platforms, and supports integration with educational and research tools.

WuDao 3.0

A multimodal model (text, images, multimedia) with 1.75 trillion parameters; provides high accuracy, scalability, and versatility

Source: self-developed

Appendices D

Table D.1. Results of the survey of educators at Chinese universities

Statements	Rating scale				
	1 - I completely disagree	2 - I disagree	3 - Undecided	4 - I agree	5 - I completely agree
Question 1: Do you agree that the following statements are barriers to the implementation of digital technologies and solutions in your educational process?					
1. Lack of a designed system, strategic planning and scientifically based strategies for transforming educational processes.			2%	22%	76%
2. Insufficient development of competencies that meet the requirements of the digital age, a shortage of expert and hybrid personnel with digital and analytical literacy.			4%	19%	77%
3. Uneven level of digital competencies among teachers, digital divide between generations.			2%	17%	81%
4. Ineffective institutional training; digital literacy training is limited to general seminars. Subject-specific requirements and individual teacher needs are not taken into account.			2%	15%	83%
5. Difficulty in making decisions on the implementation of digital technologies in educational processes due to organizational inflexibility and established university structures.			14%	15%	71%
6. The presence of bureaucratic obstacles that slow down or block the implementation of digital projects.		2%	5%	14%	79%
7. Lack of effective interaction between departments, IT services and administration at the stage of introducing digital technologies into educational practices.		3%	6%	9%	82%
8. Additional administrative burden on teachers without support, which reduces their motivation for digital change.			3%	6%	91%
9. Lack of interdepartmental cooperation, insufficient quality of communication between the structural units of the university.		8%	9%	4%	79%
10. Technostress and anxiety about rapid technological changes in teachers.			3%	11%	86%
11. The manifestation of a conflict between technology and cultural values; established cultural norms suppress the introduction of new approaches.		5%	10%	8%	77%
12. There are financial barriers. Comprehensive digital transformation of educational processes is a financially costly procedure.				6%	94%
Question 1: Do you agree that the following statements limit the implementation of new technologies in your educational institution?					
1. There is a challenge with timely updating and supporting digital educational processes in the context of rapid technological development. It is essential to constantly maintain the relevance and effectiveness of educational courses.			1%	5%	94%
2. There are gaps in the pedagogical assessment standards and continuous improvement mechanisms needed to align skills development with technological advances.			9%	6%	85%
3. There is unevenness in the use of modern digital resources by teachers, which does not contribute to the synchronization of pedagogical approaches in the process of training specialists.		1%	5%	7%	87%
4. There are challenges in integrating administrative and research systems with pedagogical processes, ensuring a balance between customization and standardization, and maintaining adaptability and compatibility in real time.				6%	94%
5. There are difficulties in adapting algorithms and platforms to local academic ethics.			12%	7%	81%
6. There are difficulties in integrating LMS, MOOC and gamification tools, and low compatibility of systems.				7%	93%
7. Teachers and students need extensive training to use technology effectively.		3%	6%	7%	84%
8. There are limitations in the adaptability of online learning platforms. Systems cannot always flexibly adapt to the individual needs of teachers and students.				3%	97%
9. Processing, analysis and interpretation of educational data requires specialized skills from specialists and constant updating of the IT infrastructure.			3%	3%	94%

10. Educational platform capabilities standardize teaching, limiting creative approaches. There is a lack of flexible content creation tools.				4%	96%
11. Insufficient infrastructure, especially in rural areas – outdated equipment, weak Wi-Fi and low internet speeds reduce the effectiveness of digital learning outside of large cities.				3%	97%
12. Programs and applications may regularly freeze or work intermittently, which hinders the learning process and reduces the quality of learning.			1%	2%	97%
13. There are difficulties with updating and scaling systems. Implementing new features or expanding to a larger number of users can be costly and time-consuming.			2%	7%	91%
Question 3. Do you agree that these recommendations can improve the quality of digital learning at your university?					
1. The implementation of digital educational technologies in universities should take place in accordance with national directives to stimulate digital transformation.			3%	3%	94%
2. It is necessary to raise educational standards and promote technological advances in teaching methods and curricula to prepare students with the necessary 21st century skills.			1%	2%	96%
3. It is necessary to modernize the infrastructure – update networks, VR/AR laboratories, and server equipment to ensure stable operation of the technologies.				2%	98%
4. It is important to develop cooperation between universities and businesses to ensure that education meets industry requirements.			6%	5%	89%
5. It is necessary to create hybrid teams and interdisciplinary collaboration, as well as virtual environments that bring together faculty, IT specialists, and data analysts to jointly develop solutions.			1%	4%	95%
6. It is necessary to implement generative AI and data analytics tools into learning management systems to improve the personalization of the educational process and the efficiency of working with educational data.				2%	98%
7. It is important to ensure compatibility between educational, administrative and research systems.			4%	7%	89%
8. It is necessary to create an integrated ecosystem – combining LMS, MOOC, VR/AR and AI platforms into a single system for seamless interaction and data exchange.				3%	97%
9. It is necessary to constantly improve digital, information, and AI literacy, and provide systematic training in working with new technologies and analytical tools.			1%	3%	96%
10. It is important to develop effective technical support systems and cybersecurity strategies, to provide technical support for the educational process, to protect data and to ensure confidentiality when using digital tools.			2%	5%	93%
11. It is necessary to localize and adapt content – develop courses and simulations that fully comply with the programs of Chinese universities and the characteristics of students.				2%	98%

Source: self-developed