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**ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ КАК ФАКТОР МОДЕРНИЗАЦИИ
ВЫСШЕГО ОБРАЗОВАНИЯ В СОВРЕМЕННОМ КИТАЕ**

Стремительное развитие технологий искусственного интеллекта произвело революцию в высшем образовании Китая. Новейшие технологии изменили траекторию его развития и поменяли его фундаментальные смыслы. В современную эпоху оцифровка высшего образования и интеграция искусственного интеллекта в его основу стали ключевыми темами в реформе образования и инновациях. Однако этот технологический скачок также сопряжен с многочисленными проблемами. В современном мире перед обществом возникают ключевые вопросы: как использовать цифровую трансформацию для развития высшего образования в Китае, как понять фундаментальную логику цифрового высшего образования в контексте развивающихся отношений между человеком и технологией и как разработать надежные рекомендации по использованию искусственного интеллекта. В современном мире перед обществом возникают ключевые вопросы: как использовать цифровую трансформацию для развития высшего образования в Китае, как понять фундаментальную логику цифрового высшего образования в контексте развивающихся отношений между человеком и технологией и как разработать надежные рекомендации по использованию искусственного интеллекта. Решение этих вопросов необходимо для беспрепятственной интеграции искусственного интеллекта в китайское высшее образование, его глубокой интеграции и стимулирования образовательного прогресса. В данной статье рассматриваются эти важнейшие вопросы, исследуется потенциал и подводные камни использования искусственного интеллекта в высшем образовании, чтобы наметить путь для успешной интеграции этой технологии в образовательный процесс не только Китая, но также использования в прогрессивных образовательных методиках всего мира.

Ключевые слова: искусственный интеллект, китайское высшее образование, модернизация образования, цифровое высшее образование.

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**ARTIFICIAL INTELLIGENCE AS A FACTOR
IN THE MODERNIZATION OF CHINESE HIGHER EDUCATION**

The rapid development of artificial intelligence technology has revolutionized higher education in China. The latest technologies have changed the trajectory of its development and changed its fundamental meanings. In the modern era, the digitization of higher education and the integration of artificial intelligence into its foundation have become key topics in education reform and innovation. However, this technological leap also comes with numerous challenges. In today's world, society faces key questions: how to use digital transformation to develop higher education in China, how to understand the fundamental logic of digital higher education in the context of the evolving relationship between people and technology, and how to develop reliable guidelines for use artificial intelligence. In the modern world, society faces key questions: how to use digital transformation to develop higher education in China, how to understand the fundamental logic of digital higher education in the context of the evolving relationship between humans and technology, and how to develop reliable recommendations for the use of artificial intelligence. Resolving these issues is necessary for the smooth integration of artificial intelligence into Chinese higher education, its deep integration and stimulation of educational progress. This article addresses these critical issues, exploring the potential and pitfalls of using artificial intelligence in higher education to chart a path for the successful integration of this technology into the educational process not only in China, but also for use in progressive educational methodologies around the world.

Keywords: artificial intelligence, Chinese higher education, modernization of education, digital higher education.

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Preamble. Artificial intelligence technology is widely used in various fields with the continuous development of science and technology. As an important stage of cultivating talents, higher education must keep pace with the times and introduce artificial intelligence technology to achieve modernization. This paper will discuss the role and impact of artificial intelligence technology in the modernization of higher education, and how to apply artificial intelligence technology to improve the quality of higher education.

The relationship between artificial intelligence technology and the modernization of higher education.

Concepts and characteristics of artificial intelligence technology. In the 1950s, Alan Turing proposed a solution to the problem of when a human-designed system is “intelligent”. Turing proposed the imitation game, a test involving the ability of a human listener to distinguish between a conversation with a machine; If no such distinction is found, we can recognize that we have an intelligent system, or artificial intelligence (AI). It must be remembered that the interest in AI solutions dates to the 1950s; In 1956, John McCarthy offered one of the first and most influential definitions: “The study of artificial intelligence is based on the idea that every part of learning or any other part of intelligence can be described very accurately. This means that we can, in theory, describe it so well that we can build a machine to imitate it.” (Russell and Norvig 2010). Artificial Intelligence, or AI, is now understood by scholars as the imitation of human intelligence using software programming methods. Today, AI can be found in many areas, including cloud-based business tools, consumer-facing applications, and even built-in device software. It consists of systems that are capable of reasoning, discovering meaning, generalizing, and learning from past experiences [1]. Based on our understanding of AI, it has the following five characteristics:

1) Adaptability. Human intelligence is powerfully adaptive and can find effective solutions in a variety of different environments and situations.

2) Learning ability. Human intelligence manifests itself as a powerful learning ability that can continuously improve and optimize behavior through experience.

3) Abstract thinking. Human intelligence can think abstractly, generalizing, reasoning, and critiquing concepts and principles.

4) Creativity. Human intelligence is creative and capable of generating new ideas, concepts, and solutions.

5) Emotion and Consciousness. Human intelligence is closely related to emotion and consciousness, which enables people to understand and deal with complex social situations and interpersonal relationships.

Connotation and Path of Modernization of Higher Education. Modernizing higher education is a very important goal for China's educational development. This is to make sure that the higher education system keeps up with the needs of modern society, scientific and technological progress, and globalization. To modernize Chinese education, we should start with its higher education system. Modernization is a “man-made, purposeful and planned process of social change”, a process of evolution of social, economic, and cultural systems, and a process of transformation of civilization. To realize the modernization of higher education, China has always insisted on giving priority to the development of education and putting education in the strategic position of priority development. The development and progress of a country go hand in hand with the development and progress of education. Modernizing education is crucial for modernizing the country, and educational innovation helps China move faster towards becoming an innovative nation [2]. In short, the modernization of China's higher education is a process of continuous exploration and progress, aiming to cultivate more excellent talents and promote China's development and social progress.

Mechanisms of interaction between artificial intelligence technology and modernization of higher education. Artificial intelligence technologies are increasingly used in the field of higher education, with actual and potential impacts on the education system and scientific research. The mechanisms of interaction between AI technologies and the modernization of higher education are characterized as follows:

In recent years, artificial intelligence technology has quickly developed and is now being used in all areas of society. In education, there's a new field called “Educational Artificial Intelligence” (EAI) that combines education with AI technology. EAI mainly uses AI to analyze and understand how people learn. It also uses AI to change teaching methods, making learning more efficient for students, and teaching more effective for teachers. The combination of artificial intelligence technology and education science forms a brand-new research field of educational artificial intelligence. In 2017, both the basic education version and the higher education version of the horizon report predicted that AI technology will become the mainstream educational application technology in 4–5 years [3].

Current status and development trend of the application of artificial intelligence technology in the field of higher education.

Application scenarios and cases of artificial intelligence technology in the field of higher education. Science and technology have had a great impact on the development of education, especially in promoting and facilitating new forms and modes of education

and in promoting equity and fairness in education [4]. In the era of artificial intelligence, the development of technologies such as virtual reality and robots have made technology play a more profound role in promoting education, especially in the reform of education and the development of new education models.

Using technology to simulate teaching content helps students visualize and understand what they are learning, as well as perform experiments. This has always been a goal in education, especially in educational technology. Virtual reality (VR) teaching has taken this to a new level [5]. In medical teaching, for example, VR technology is used for research, teaching, and practical operations. Surgical plans can even be created, practiced, trained, and planned on a virtual human body.

China's top medical research centers are now using the latest technologies like 3D, VR, and artificial intelligence to create a better virtual simulation platform for medical teaching. For instance, Nankai University in Tianjin has developed seven virtual simulation teaching projects with their own intellectual property rights. One of these projects was even named a national virtual simulation experimental project and received 11 software copyrights. They also created a new experimental teaching mode that combines virtual and real-world elements, which has been very successful in practice. Nankai University also built a large VR training room with a ring-shaped screen that gives students an immersive learning experience. This room relies on an open virtual simulation teaching management system to improve experimental teaching and sharing [6]. Medical researchers often need to simulate operations, and virtual reality technology provides them with a more accurate and intuitive way to teach. For example, researchers at Nankai University's Medical Research Institute use multi-modal, multi-source data acquisition to simulate the structure of the human body at different scales, like cells, tissues, organs, and systems. They then use this data to create a digital human body model that can be used for training and surgical planning. Currently, China has organ models for the heart, liver, lungs, stomach, mouth, and other areas that are used for surgical training and planning. These models can be used to set up various abnormalities for training purposes. The virtual human body has evolved from a visual representation to a geometric, physical, and then digital representation. The digital human body can be used for medical research, surgery planning, previews, drug development, and comprehensive medical teaching. For example, teachers and students can use the digital human body to demonstrate human anatomy by disassembling and assembling human organs. Compared to physical materials, which can be difficult to reuse, the digital human body can be constantly updated and upgraded. Many medical colleges and universities in China have already

started using VR for simulation training in oral surgery and laparoscopic surgery.

AI is used not just in medical research at Chinese universities, but also in their libraries. Zhejiang University, a top school in China, was one of the first to use robots to put books in order. In 2018, they started using a smart robot that can neatly arrange books on shelves in just a few minutes [7]. This robot fixes the common problem of books being in the wrong place and hard to find, making things easier for both students and library staff. This robot is a big step forward for library management and for using smart technology in education. It works fast and accurately, saving time and effort for librarians and helping students find what they need quickly. This makes learning more efficient and research more convenient.



To fix the issue of sorting books, Nanjing University and the Sino-Singapore Tianjin Eco-city worked together to create China's first high-frequency RFID book sorting robot. This robot uses many different technologies, like RFID perception, computer vision, and intelligent robotics, to keep track of books automatically and accurately. This robot solves the problem of having to close the library to manually count the books, which used to be a big headache. It not only makes the bookshelves more organized, so it's easier to find books, but it also frees up librarians from boring, repetitive tasks. This means librarians can focus more on giving personal service to readers.

Artificial Intelligence, which is the newest and most powerful technology, is slowly becoming a key part of higher education in China. It gives teachers and students more variety in their teaching tools and gives a big boost to the growth of higher education in China.

Scale and level of application of AI technology in China's education sector. New technologies like cloud computing, big data, the Internet of Things, artificial intelligence (AI), and blockchain are making education smarter. By 2021, AI's main industry was worth 1998 billion yuan. In 2022, China's digital

education industry grew quickly because of government support, faster education technology, and big market demand. It grew to 315.9 billion yuan, with online education at 120.2 billion yuan, smart campuses at 73.25 billion yuan, and smart classrooms at 122.45 billion yuan. Computer vision is the most important AI technology for education innovation. As data becomes more important, the market for machine learning products that help with decision-making will also grow. Besides AI technology, the need for AI chips to do complex calculations also helps the AI industry grow.

AI is being used more and more in Chinese higher education, which brings both new chances and challenges. As AI technology keeps improving, its use is expected to grow even more, giving Chinese higher education a big boost.

Prospects and directions for the application of artificial intelligence technology in the field of higher education. Artificial intelligence (AI) is transforming all parts of university education in China. Because of the new coronavirus, online education in China is changing a lot in terms of how much and how well it's done. AI is also being used more and more in Chinese higher education. There are four main ways AI is being used: smart campuses, three-dimensional comprehensive teaching fields, intelligent online learning platforms based on big data, and intelligent education assistants. These are all helping to make education better and more efficient [8].

1) The smart campus is an advanced version of the digital campus. It uses technology to make the campus more efficient, comfortable, safe, and environmentally friendly. This includes building equipment, network communications, information appliances, and equipment automation. The smart campus is a basic way to use "Artificial Intelligence plus Education".

2) Multi-learning spaces are places that combine online and offline learning. They help teachers teach and support students' personal learning styles. Smart classrooms, digital laboratories, and innovation labs are examples of multi-learning spaces. They are an important part of "Artificial Intelligence plus Education". These spaces use a mix of subjects, different teaching methods, and various resources to support students' learning.

3) Online learning platforms based on big data intelligence are a common way to use "artificial intelligence + education". These platforms use educational data to provide personalized learning for students. They also give real-time feedback, learning analytics, and digital portraits of learners.

4) Intelligent educational assistants use artificial intelligence to help teachers, students, and administrators. They provide convenient and intelligent educational services through lightweight applications. Some examples of intelligent educational assistants

are intelligent tutors, educational robots, and learning partners. They all help with personalized teaching and learning. Additionally, education intelligent agents are a type of intelligent education assistant [9].

The promotion and impact of artificial intelligence technology on the modernization of higher education.

Artificial intelligence technology to enhance the quality and efficiency of higher education. Artificial intelligence (AI) has greatly improved the quality and speed of higher education. AI teaching systems can monitor students in real-time, giving each one a personalized learning plan and resource suggestions. This makes teaching more tailored to each student, boosting their learning. Plus, AI uses students' learning data to see how they're doing in classes and gives feedback. This feedback helps teachers teach better. AI can also spot problems students might have and tell teachers, helping them focus on students' needs and teach more effectively.

In higher education, AI not only helps students learn better but also makes teachers more efficient and improves teaching quality. As technology keeps improving, AI will bring big changes to the quality and efficiency of higher education.

Artificial Intelligence Technology Enhances Equitable Inclusion in Higher Education. With the rise of science and technology, artificial intelligence (AI) is increasingly used in higher education. This technology not only makes education more efficient but also fairer and more inclusive. AI breaks down the spatial and temporal barriers in higher education, making it more accessible to everyone. In China, for example, high-quality educational resources are often concentrated in economically developed areas. This creates an imbalance, making it difficult for students in less developed regions to access these resources. However, with the help of network technology, these resources can now be shared with more students, reducing waste and promoting educational equality. AI also broadens the communication platform for teachers. In the past, teachers mainly interacted within their own schools. But now, through online platforms, teachers from different schools can learn and collaborate with each other, improving their teaching skills and promoting the development of high-quality education. Finally, AI provides students with personalized learning options. Educational equity means giving everyone equal educational opportunities, not necessarily the same outcomes. Since everyone is unique, they have different preferences and choices. Traditional classroom teaching often focuses on the overall level of students, sometimes ignoring individual differences. But with the development of network technology, students can now choose what they want to learn from a vast array of online resources. In summary, AI is revolutionizing higher education by breaking down spatial and

temporal barriers, promoting educational equality, and providing personalized learning options for students.

Furthermore, AI technology that has become available in recent years can use big data to conduct personalized analyses of college students' learning processes. This allows for the identification of key points and challenges, which are then presented through an instant testing system. As a result, students can use these insights to focus their studies more effectively [10].

Artificial Intelligence Technology to Promote Innovation and Transformation in Higher Education. Artificial intelligence (AI) is currently a major force driving innovation and development in Chinese higher education. It's helping to transform all aspects of higher education, including teaching methods, practical learning, and talent development goals.

AI is constantly improving the content, structure, and format of higher education in China. To keep up with these changes, educational institutions need to regularly update their knowledge systems, technologies, teaching methods, activities, and evaluations. This ensures that education remains relevant and effective. The need for innovation in AI education is clear. Firstly, we need a comprehensive AI education knowledge system to guide practice and fill knowledge gaps. Secondly, we must strengthen the AI education community by supporting academic journals, institutions, and other organizations. Thirdly, we need to improve AI education courses, including content selection, syllabi, and evaluation.

AI is reshaping China's educational processes and models, giving higher education the tools it needs to innovate. Using AI in higher education can enhance teaching quality and make education more accessible, personalized, intelligent, and precise. Firstly, AI expands higher education options by creating intelligent learning spaces that combine online and offline teaching. It uses technologies like image and voice recognition to create smart classrooms and provides flexible teaching tools through AR and VR. Secondly, AI personalizes higher education by developing tailored teaching programs and immersive learning experiences through intelligent learning terminals. Thirdly, AI contributes to the intelligent management of higher education. By collecting data on campus management and teaching processes, AI can improve the scientific nature of decision-making and resource allocation in higher education. Finally, AI helps to clarify the roles of teachers. By reducing their workload in teaching theoretical knowledge, AI allows teachers to focus on areas where human intervention is crucial, such as ideological education, personality development, and emotional cultivation.

Artificial intelligence (AI) blurs the lines between industries and changes higher education. It pushes for new ways of teaching and learning. Because of AI, the traditional idea of what higher education

should be is changing. Higher education that uses AI can help reach teaching goals in new and exciting ways. AI also helps make higher education better. It changes how we think, work, and live. It brings new technologies and ways of doing things to industries. This means we need people with different skills. To meet these needs, higher education must change how it teaches to include AI. When AI is used a lot in higher education, it creates a more engaging and interactive learning environment for students. Lastly, AI brings new tools to higher education. In the past, we had chalk, blackboards, and workshops. Now, we have cloud-based courses, smart technologies, and virtual reality. These new tools help us keep innovating in higher education, expand learning opportunities, and fully meet students' needs.

Artificial Intelligence Technologies to Optimize Higher Education Governance and Services. In recent years, digital technology, especially artificial intelligence (AI), has greatly affected how colleges and universities manage education and their teaching methods. Facing these new technologies, it's very important for colleges and universities to use AI to improve their management, as advised by the Chinese Ministry of Education.

AI brings many challenges to the traditional way Chinese universities are managed. For example, while universities can now easily collect large amounts of student data, they need people who understand AI well to analyze and use this data properly.

As higher education in China improves, AI is helping universities manage and provide better services. Although AI brings challenges, it also points to new ways for universities to manage and serve their students. Universities should study AI technology to understand it better and make better decisions about education. They can also organize teams to research AI and improve the accuracy of their management.

Universities should also help teachers and students learn more about AI. They can offer courses on AI to students from different departments and use AI to create virtual assistants for teachers and students. This will help teachers and students make better decisions about teaching and learning. Universities can also organize competitions and projects to help students practice using AI.

Universities should work with high-tech companies to research and use AI. By working together, they can get more resources and support for AI research. They can also share their technology, equipment, and knowledge to help AI develop further. When possible, they can even build labs together to conduct research, develop new technologies, and train talent. This will help combine academic research with practical use, speed up the application of AI in different industries, and turn research results into products and services that can be sold [11].

In simple terms, colleges and universities need to consider their long-term goals and create a plan for digital transformation that fits their specific needs. This will help digital technology become a real force for positive change in education. To do this, they must also think about how to improve their campus technology and invest in better networks and IT infrastructure. This way, digital transformation can truly enhance teaching and research [12].

Countermeasure suggestions for playing a positive role of artificial intelligence technology in the modernization of higher education.

Strengthen policy guidance and support to create a favorable development environment. To embrace the future, we must vigorously advance the digitization of higher education and harness the potential of AI technology in modernizing Chinese universities. This endeavor demands continuous refinement of our educational policies, systematic planning, and a strategic approach aligned with national objectives. We must enhance the institutional frameworks and foster an ecosystem conducive to digital education. Furthermore, we need to transform teaching methodologies in higher education to chart a path toward digitization tailored to our national context [13].

The integration of artificial intelligence can significantly enhance the informatization of teaching resources, thereby facilitating the development of comprehensive courses [14]. Government support is crucial in this regard. For instance, the MOOC platform, as the most widely used informatization education resource platform in Chinese colleges and universities, has experienced a surge in users since the COVID-19 outbreak. This underscores the need for the government to bolster the construction of such platforms, expand the availability of informatization education resources, and ensure equitable development opportunities. This will empower AI technology to better serve educators and students, promoting equity in higher education.

Moreover, education in its contemporary form must adequately respond to the challenge or trend of universalizing online learning through various computer platforms and global communication networks. This shift necessitates innovative approaches that leverage technology to enhance the accessibility and quality of education for all [15].

Accelerate technological innovation and application to enhance core competitiveness. Accelerating the integration and utilization of artificial intelligence (AI) technology in higher education holds immense potential for bolstering the sector's core competitiveness. According to a report published in China Higher Education magazine, AI has been identified as a key trendsetter, featured prominently in the Horizon Report for the past five consecutive years, and recognized as a driving force for enhancing teaching and learning practices in higher education.

However, despite its promise, AI technology still requires refinement, and its integration into higher education remains in its nascent stages. As AI increasingly becomes a part of educational landscapes, concerns arise regarding whether its intelligence can achieve the necessary level of accuracy for practical application. It is crucial to remember that technology is a tool shaped by human labor and ingenuity; its effectiveness in higher education depends on embedding it within a well-designed teaching framework.

To capitalize on the potential of AI, colleges and universities must undertake strategic measures. This includes optimizing their scientific and technological innovation systems and discipline structures to align with the evolving nature of AI. This adaptation should involve both enhancing the AI-related discipline system and fostering the development of "new engineering" approaches that integrate AI with other fields, creating a composite "AI + X" professional training model.

Furthermore, universities should be encouraged to engage in technology transfer and applied research in areas such as intelligent education, manufacturing, healthcare, smart cities, agriculture, finance, justice, and national defense security. By strengthening application demonstrations and collaborating with relevant industries, universities can facilitate the emergence of new industries and business models within the education, culture, healthcare, transportation, manufacturing, agriculture and forestry, finance, security, and defense sectors. This collaboration can nurture a cohort of AI-driven enterprises that will spearhead the development and deployment of AI technologies.

In conclusion, while harnessing the power of AI in higher education is promising, it requires careful consideration of its accuracy and feasibility within an appropriate educational framework. Concerted efforts from both governments and universities are essential to advance the research and implementation of AI technologies in higher education settings, unlocking their transformative potential for teaching and learning.

Strengthening ethics and regulation to prevent potential risks. While AI technology holds a pivotal position in modernizing higher education, we must also be cognizant of the potential risks and challenges posed by its widespread application. To address these concerns, the National Professional Committee on the Governance of the New Generation of Artificial Intelligence has introduced the Code of Ethics for the New Generation of Artificial Intelligence. This code aims to seamlessly integrate ethics into the entire lifecycle of AI, providing ethical guidelines for individuals, legal entities, and other relevant organizations involved in AI-related endeavors. Furthermore, to bolster the ethical framework and regulation of AI, and to mitigate potential risks, several measures

are essential: Fortifying bottom-line thinking and risk awareness to ensure responsible AI development; Enhancing research and assessment of potential risks associated with AI advancements; Conducting timely and systematic risk monitoring and evaluations; Establishing an effective risk warning mechanism to proactively address ethical concerns; Improving the capacity to manage and mitigate ethical risks related to AI.

Additionally, it is imperative to:

Respect the inherent laws of AI development while acknowledging its capabilities and limitations; Continuously refine governance mechanisms and approaches, ensuring they remain grounded in reality and avoid the pitfalls of quick fixes, especially in the context of higher education; Urge AI researchers and developers to adhere to a robust value system, preventing biases in data and algorithms, and striving for an AI system that embodies universality, fairness, and non-discrimination; Mandate that AI technology providers clarify their duty to inform the public and bolster their emergency response measures; Encourage users of AI products to ensure responsible usage, preventing misuse, abuse, or malicious intent [16].

Increase the training and introduction of talents to create a professional team. Artificial intelligence represents the forefront of scientific and technological advancement, making it imperative to prioritize the fostering and acquisition of AI talent. Building a robust team of experts in this domain is not only essential but also critical to maintaining a competitive edge [17]. According to a report featured on Guangming.com, establishing a comprehensive AI talent ecosystem is paramount. This ecosystem should focus on actively attracting and developing much-needed AI talent, ultimately aiming to create a globally renowned hub for AI expertise.

To achieve this ambitious objective, it's crucial to address two fundamental questions: "Why is it

vital to enhance our intelligent talent pool?" and "How can we effectively assemble such a team?" The answer to the first question lies in China's progression from traditional to next-generation AI. This new era of AI mimics human intelligence, encompassing perception, cognition, behavior, interaction, learning, and self-growth. Aligning our talent development efforts with this evolution is essential for realizing our strategic aspirations.

Regarding the second question, constructing an intelligent talent team demands a multifaceted approach. By blending international talent recruitment with local training programs, aligning talent development with industry needs, and fostering symbiosis between platform construction and mechanistic innovations, we can steadily refine our intelligent talent ecosystem. This holistic strategy aims to establish China as a global leader in AI talent aggregation. Specific actions include: Bolstering international talent attraction to gain a competitive advantage; Swiftly developing a dynamic talent training system attuned to industry demands; Constructing a world-class AI innovation platform and pioneering novel mechanisms for talent aggregation and utilization [18].

Conclusions. Artificial intelligence has an important significance role as a factor in the modernization of higher education in modern China. The personalized and intelligent development of higher education can be realized through artificial intelligence technology. Students can learn according to their own needs and levels and improve their learning results. Teachers can teach and assess with the help of AI technology to provide a better teaching experience and personalized guidance. The application of artificial intelligence technology will further promote the modernization process of higher education and contribute to the cultivation of talents with innovative ability and competitiveness.

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